This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

600043170L

~~H 204.~~
Y 31ª

716

TAYLOR INSTITUTION.

BEQUEATHED

TO THE UNIVERSITY

BY

ROBERT FINCH, M. A.

OF BALLIOL COLLEGE.

1695 e. 52

ON THE

PISA AND ASCIANO WATERS

IN TUSCANY;

WITH THE

WATER OF YVERDUN,

IN SWITZERLAND, &c.

A
CHEMICAL DISSERTATION
ON THE
THERMAL WATERS OF
PISA,
AND ON THE NEIGHBOURING
ACIDULOUS SPRING OF
ASCIANO:

With an HISTORICAL SKETCH of PISA,
And a METEOROLOGICAL ACCOUNT of its WEATHER:

TO WHICH ARE ADDED,
ANALYTICAL PAPERS
RESPECTING THE
SULPHUREOUS WATER OF
YVERDUN.

BY JOHN NOTT, M.D.
OF
BRISTOL HOT WELLS.

> ——— Juvat integros accedere fontes,
> Atque haurire. ——
>
> LUCRETIUS.

LONDON:
PRINTED FOR J. WALTER, CHARING-CROSS.
M.DCC.XCIII.

TO

RICHARD WARREN, M. D.

PHYSICIAN TO HIS MAJESTY,

&c. &c. &c.

IN HOPES OF INTRODUCING TO A MORE GENERAL UTILITY,

AND

TO THE FUTURE ATTENTION OF OUR PHYSICIANS,

CERTAIN

MINERAL WATERS,

OF MUCH MEDICINAL VALUE,
ALTHOUGH HITHERTO BUT LITTLE NOTICED,

THIS

CONCISE ACCOUNT
OF THEM

IS INSCRIBED,

WITH GRATEFUL REGARD,

BY HIS OBLIGED
AND FAITHFUL SERVANT,

JOHN NOTT.

Briſtol Hot Wells,
JUNE 1, 1793.

CONTENTS.

DISSERTATION on the PISA and ASCIANO WATERS.

Preface - - - Page iii*
Situation of the Baths - - 9*
Structure of the Piſan Mountains - 12*
Mineral and Vegetable Production - 17*
Qualities of the Waters - - 28*

The Acidulous Water of ASCIANO.

Situation of the Spring - - 59*
Properties of the Aſciano Water - 61*
Analyſis by Evaporation of the Aſciano Water 65*
Of the common Spring Water of Piſa, and of the Bath Fountains - - 67*
Medicinal Virtues of the Piſa Bath Waters 72*

Hiſtorical Sketch of the Town of PISA 83*
Meteorological Account of the Weather at PISA - - - 101*

Analytical Papers relative to the Mineral Sulphureous Waters of YVERDUN.

Introductory Obſervations - Page 1
Situation of the Baths - - 7
Town of Yverdun - - 9

Analyſis of the Mineral Baths of YVERDUN: *by Monſ.* STRUVE - - 13

Preliminary Examination - - 16
Chemical Analyſis made at their Source - 22
——— made at Lauſanne - - 25

A Letter from Monſ. D'Yvernois, relative to the Waters of the Baths - - 34
Analyſis of the Waters of the Baths - - 37
Method of uſing the Yverdun Waters, both as a Bath and Pump - - 44

DISSERTATION

DISSERTATION

ON THE

PISA and ASCIANO WATERS.

PREFACE.

THE following brief account of the Pisa Waters is the ſubſtance of a well-written treatiſe in Italian, by Giorgio Santi, profeſſor of chemiſtry and natural hiſtory in the univerſity of Piſa.

This ingenious profeſſor, from whoſe amiable manners and enlightened converſation I have reaped much pleaſure and inſtruction during a reſidence of two different winters at Piſa, informs us, that his work was the fruit of a ſummer vacation from his duties at the univerſity, and undertaken merely for his own amuſement and curioſity.

After obſerving how much theſe Waters have employed the medical pen, he tells us, that he ſhall leave unnoticed the treatiſes of the laſt century, not excepting even that of the pompouſly learned Mercuriale; mentioning only four writers of the preſent age, which ſhall be named at the end of this preface; and he modeſtly apologizes for offering to the world his treatiſe, after thoſe of ſuch able perſons; but he juſtly remarks, that ſince their time chemiſtry has received ſuch new lights, as invalidate much of what they have advanced.

Informed of the qualities of theſe Waters, the foreign phyſician, ſays he, may recommend them with greater confidence to the emigrating invalid, and the naturaliſt may thank me for my liſt of the productions of their ſoil.

He conjectures, that although ancient writers are almoſt ſilent reſpecting theſe thermal waters, ſtill they might have been in uſe among a people who ſo frequently employed baths for the purpoſes of religion and cleanlineſs. They very poſſibly were uſed as ſuch, during the time of the Greek coloniſts and Etrurians. That the ſpot was formerly a place of ſome note ſeems evident from the fragments of antique pillars and architectural ornaments ſound near it. On one is the following mutilated inſcription, now inſerted and preſerved in the facade of the eaſtern bath:

.....S· M· L· EROS· AQU...
....RUM AEDICLAM ....

But that baths exiſted on this very ſite, he adds, is not probable, from the ſmall ruin of an ancient aqueduct at the foot of the mountain where the warm ſprings ariſe, which, we may fairly conjecture, ſupplied the cuſtomary baths of Piſa, whoſe inhabitants would not ſeek for their uſual baths four miles diſtant from the town. Moreover, Pliny cites a paſſage which goes to prove, that in his day the place was only the marſhy habitation of frogs. *Patavinorum aquis calidis virentes innaſcuntur herbæ, Piſanorum ranæ.* HIST. NAT. LIB. 2. CAP. 103.

He then proceeds to give the outline of the modern hiſtory of the Baths.

They certainly had ſome medical eſteem

in

in the year 1161, ſince the government thought them worth their notice and inſpection; for we have a record reſpecting the election of an officer of the *Baths of the Piſan mountain*, to keep them clean and in repair.

During the Civil and Lucheſe wars they were laid waſte; but Pietro Gambacorta, counſelled by his phyſician Ugolino da Montecatini, reſtored them.

When the Florentines, led by Count Orſini, invaded the Piſan territory, the building was deſtroyed by fire, becauſe it was unhappily near a little fortreſs of the enemy's.

Under the Florentine dominion, in the 15th century, the baths were rebuilt but ſlowly and incompletely; till Francis I. perfectly re-eſtabliſhed them, and ordered his phyſician Girolamo Mercuriale, then univerſity profeſſor at Piſa, to write their hiſtory.

At the cloſe of the laſt century they were in a ruinous ſtate, and became the property of a religious ſociety at Piſa, the Miſericordia, who erected a commodious dwelling on the ſpot, which alſo fell into neglect and decay with the extinction of the Medicean dynaſty. Forty years ago, by order of the emperor Francis, of glorious memory, they were entirely and elegantly rebuilt.

Now, in a noble ſquare, adorned with two fountains, ſtand diſtinct the eaſtern and weſtern baths; and adjoining are ſince eſtabliſhed ranges of excellent lodging-houſes.

WRITERS ON THE PISA BATH WATERS IN THE PRESENT CENTURY.

GIUSEPPE ZAMBECCARI, anatomical profeſſor in the univerſity of Piſa. His book was printed at Padua, 1712. He ſays, the waters contain ſalt, nitre, vitriol, bitumen, ſulphur, and gypſum.

Antonio Cocchi, of Florence, publiſhed his treatiſe, 1750, in honour of the newly-conſtructed baths. He pretends that the waters have in them calcareous earth, ſea ſalt, ſal ſoda, and a ſulphureous ſpirit.

Giovanni Bianchi, a phyſician of Rimini, better known by the whimſical name of Giano Planco, wrote his account in 1757. He finds in the waters nitrated calcareous earth, a ſalt of the nature of Epſom ſalt, mineral elaſtic ſpirit, ſpirit of iron, and ſpirit of ſulphur.

Bartolommeo Meſny, a phyſician of Lortaine, publiſhed an analyſis, 1758, in Italian and in French. He gives to the waters calcareous earth, ſulphur, iron, a ſalt of the nature of *arcanum duplicatum*, or vitriolated kali, and a bole.

CHEMICAL DISSERTATION, &c.

SITUATION OF THE BATHS.

THE fruitful plain of Piſa, watered by the Arno, is bounded to the S. by gentle hills, to the W. by the ſea, and to the N. by a chain of mountains, which, inclining ſouthward, are called the Piſan mountains: at the foot of theſe, 4 miles diſtant from the town of Piſa, are the Baths. A canal, running from the river Serchio to the Arno, accompanies the road. Vines, fruit trees, and poplars, decorate the country.

The air of the Baths is moiſt, but pure; and in ſummer the heats are tempered by the N. W. breeze, which blows regularly from 10 in the morning till night. In other ſeaſons ſoutherly winds prevail, particularly the S. W. which, blowing over a tract of open country againſt the mountains, is repelled in ſtrong eddies. The winter is uncommonly mild here, as the Piſan mountains exclude the N. blaſt.

Strangers, particularly invalids, who viſit the Baths, ſhould avoid the evening air, and retire home early. Where the atmoſphere is moiſt, there is always an increaſed damp at the cloſe of the day, which is generally noxious.

The plain is naturally marſhy, and, if dug into, the void fills with water, which accumulates and ſtagnates.

Torrents of rain and melted ſnow, falling from the tops of mountains, wear away their vegetation and ſoil. The larger maſſes of connecting ſtone, in courſe of time, are disjointed, and roll down into the vallies, which thus increaſe their elevation, as the mountains proportionably diminiſh. Thus was the plain of Piſa formed. Mountainous fragments rolling towards the Mediterranean, and accumulating, diſplaced a portion of the ſea, and became ground. They moreover divided, and formed new beds for the Serchio and Arno, which, according to Strabo, once entered the ſea by one common mouth.

The inſalubrity of this new ground, from its ſtagnant waters, called for art and induſtry to remedy the evil, by draining it. The work was ſucceſsfully begun; it was interrupted by the troubles during the republic; but the princes of later times have happily completed it. The robuſt health of the peaſantry now beſpeak the ſituation wholeſome; and phyſicians aſſure us, that no diſeaſe prevails in it.

STRUCTURE OF THE PISAN MOUNTAINS.

THE Piſan mountains are part of an amphitheatric chain, extending from N. W. to E. and beginning from Ripafratta, where the Serchio flows from the Lucheſe to the Piſan territory. They then run ſouthward as far as the mountain Verrucola; whence, forming an angle, they go northward, and quitting Piſa, terminate diſtinctly in the Bientine lake, detached from the great link of the Apennines.

Theſe mountains differ in their heights and projections. Some exhibit ſcarce any verdure; others are clad with the oak, holm, pine, cheſnut, and cork-tree; but, above all, phillyreas and myrtles are exuberant; and on cultivated ſpots grow vines and olives.

The mountain of St. Julian, ſo called from a chapel now upon it, is that which ſupplies the water of the Baths; hence they have been ſometimes named the *Baths of St. Julian.*

On this mountain, and alſo on ſome others equally prominent, that overhang the Baths, are found diſtinct ſtones, or ſmall maſſes, moſtly white, with coloured veins, and ſtripes of calcareous ſpar. A calcareous cruſt of bluiſh grey, known by the name of *Albereſe*, often covers this ſtone, and alſo compoſes the ſurface of the mountain, particularly at its extremity. The ſtony matter that forms its nucleus is compact, and will bear a poliſh; hence it has been called marble: but its confuſed ſtructure and extreme brittleneſs will not ſuffer it to rank as ſtatuary marble.

Towards the ſummit of the mountain it is exceedingly friable and unequal; however, half way up, it has been found, though rarely, ſufficiently cloſe textured and hard.

Theſe maſſes have large fiſſures, forming ſo many ſtrata, between which, and over the calcareous ſurface, is ſpread an ochreous earth of a yellowiſh red, which tinges the circumjacent ſoil. Theſe fiſſures and ſtrata take various directions, forming that clefted ruinous appearance which diſtinguiſhes the primary and ſecondary mountains. The ſtrata are in general ſo inclined as to be almoſt vertical. In the St. Julian they are uncommonly inconſtant and irregular.

The S. and S. E. ſides of the higheſt peak of the mountain are of this fine naked marble. Graſs there grows ſcantily and partially; but on the oppoſite ſide, which, being leſs ſteep, is leſs injured by torrents, there is verdure, and even good cultivation.

The mountains which ſupport this calcareous ſcreen of the Baths vary in ſtructure and compoſition. They are of ſhiſt, opake quartz, rock cryſtal, and chief, a beautiful red-ſpotted breſcia, which laſt pierces the ſhiſt and forms the apex.

Towards Aſciano and the Verrucola, the calcareous maſſes diminiſh, and the mountains differ. One of them E. of the Baths is called Monte del Caſtellare, at the foot of which are quarries of a bluiſh lime ſtone, and of a white veined marble, known by the name of *Bardiglio.* Towards the ſummit are five holes, called *Buche delle Fate* (Mouths of the Fates) communicating with a cavern of immenſe depth. About the edge of theſe apertures grow ſome plants, which ſhall be ſpecified in their place.

To account for this excavation, let us ſuppoſe the mountain originally a ſolid maſs of ſtone and looſe earth. Rain and ſnow, lodged in ſome hollow at its top, running through, and finding an exit, waſhed away in their courſe the connecting ſoil. The unſupported ſtones then fell in, and left this vacuum. Or, referring it to higher principles in the theory of the earth's formation, and conſidering the inclination of the ſtrata, we may ſuppoſe the

Piſan mountains to have been level ground; the exterior ſtratum was calcareous, the next and principal one ſhiſtous, the lowermoſt ſiliceous; theſe were lifted up in mountainous forms by the force of the earth's internal fires, leaving a central hollow, of which this cavern is the unfilled remains.

The partial crumbling away of the calcareous covering, either by weather, or the work of man, aſſiſted in levelling the valley of Piſa; and its entire loſs accounts for the ſhiſtous ſummits of the mountains you paſs to go to Lucca, as well as of ſome others in the valley of Aſciano. Still higher up in this height, where the ſhiſt is deſtroyed, ſiliceous prominencies appear, particularly in the Monticello, the mountain which gives riſe to the acidulous water of Aſciano.

MINERAL AND VEGETABLE PRODUCTIONS.

THE ſoil about the Baths is either muddy, ſandy, or ochreous, with calcareous fragments, brought by torrents from the adjacent mountains, whoſe more varied nature it is neceſſary to inveſtigate, in order to aſcertain the qualities of the Waters.

The following minerals, ſpecimens of which are preſerved in the royal muſeum of Piſa, are found in the mountains of Caldaccoli, St. Julian, on the declivities of thoſe which form the Lucca mountain road, on Monte Bianco and its vicinity, on Monte Caſtellare, Belvedere, Faeta, Colle and its prolongation, from which iſſues the acidulous water of Aſciano.

Minerals.

* Calcareous ſpar of a radiated priſmatic cryſtallization.

Grey calcareous ſtone, with calcareous priſmatic ſparry cryſtals.

Grey calcareous ſtone, covered with a laminated cryſtallization of calcareous ſpar.

Calcareous ſtone, with cryſtals of calcareous ſpar, in rows.

Various calcareous ſtones, ſtriated with ſparry cryſtallizations.

* Lead-coloured calcareous ſtone, called *Pietra da Calcine forte.* It makes a lime far ſuperior to the white.

* Calcareous ſtone veined with ſpar.

Grey calcareous ſtone with round whitiſh ſpots.

* Fine white grained marble.

* Fine yellow grained marble.

* Fine white grained marble, ſomewhat veined with yellow.

* Fine white grained marble, incruſtated with a yellowiſh calcareous ſpar.

* Fine white grained marble, with earthy veins of yellow. Theſe veins were, I conjecture, originally of ſpar, which had fallen out; and they are now partially and accidentally filled up with a yellow earth.

* Fine grained white marble with reddiſh veins.

* A white fine grained fiſſured marble.

* A fine grained grey marble, ſpotted with white, called *Bardiglio*.

Fine grained marble, with veins of tranſparent calcareous ſpar.

Fine grained Breſcia of a duſky red.

Calcareous tartar.

Calcareous tartarous ſtones.

* Fine grained white marble, incruſtated with calcareous tartar, either white or yellow.

* Fine grained white marble, with a calcareous incruſtation in whimſical ramifications.

Various calcareous ſtalactites.

Various calcareous ſtalamites.

* Grey calcareous ſtone, with black denditres.

* Grey calcareous ſtone, with reddiſh denditres.

* Yellow earth, largely found between the lamina of the calcareous ſtones, and on the ſurface of the mountains.

* Reddiſh

* Reddiſh ochreous earth, found as the preceding.

On analyſis, theſe two laſt produce limeſtone and magneſia, which moſt abound in the red, argillaceous earth, which moſt abounds in the yellow, a ſmall quantity of ſiliceous earth, and iron; alſo ſome ſmall diſtinct globular bits of iron, which are hollow.

Thoſe productions marked * are moſt abundant.

The fine calcareous ſtone, commonly termed marble, bears a good poliſh, and it may be uſed for ornament; but it will not anſwer the ſtatuary's purpoſe.

On the heights of the primary ridge, and the declivity which goes from Monte Bianco into the valley of Aſciano, beſides calcareous ſtones, are found the following:

Lead-coloured ſhiſt.

Grey ſhiſt.

Reddiſh ſhiſt.

Shiſt covered with a reddiſh ochreous earth.

Micaceous thin friable ſhiſt, of a bright pale green.

Opake imperfect whitiſh quartz.

The ſame kind of quartz, with rock cryſtal in ſome of its hollows.

Calcareous pebbles incruſtated with a whitiſh quartz.

Quartz covered with lamina of greeniſh ſteatites.

Siliceous breſcia, in which enters a variety of red quartz, and enveloped with a brown ſiliceous matter.

Silex, breſcia, and ſhiſt abound, and moſtly form the higheſt points; perhaps they form the central parts of the whole chain.

Plants.

On the mountain above the Bath, and to the left.

Phillirea media
. . . . . anguſtifolia
. . . . . latifolia
Ciſtus ſalvifolius

Ciſtus tuberaria
. . . monſpelienſis
. . . helianthemum
. . . fumana

Ciſtus thymifolius
Euphorbia characias
. . . . . cypariſſias
. . . . . ſpinoſa
. . . . . ſylvatica
Rubia tinctorum
Lavandula ſtœchas
Ceraſtium vulgatum
. . . . . . viſcoſum
Satureja Juliana
Anemone hortenſis

Aſclepias vincetoxicum
Scrophularia canina
Crocus ſativus *vernus*
Origanum vulgare
Gnaphalium ſtœchas
Carthamus lanatus
Globularia vulgaris
Saponaria ocymoides
Cyclamen Europæum
Cuſcuta Europæa

On the mountain, and in the deſcent towards St. Maria del Giudice.

Echium vulgare
Euphraſia officinalis
Euphorbia dulcis
Geranium nodoſum
. . . . . diſſectum
. . . . . robertianum
. . . . . molle
. . . . . rotundifolium
Scrophularia auriculata
. . . . aquatica
Anemone nemoroſa
Viola canina
Oſmunda ſpicans
. . . . . regalis
Geniſta tinctoria

Geniſta Germanica
Sanicula Europæa
Veronica officinalis
. . . . . Chamadrys
Chlora perfoliata
Ophrys ovata
Cichorium intybus
Trifolium agrarium
. . . . . rubens
. . . . . ſtellatum
Buphtalmum ſpinoſum
Draba muralis
Filago arvenſis
Sphagnum arboreum
Mnium hornum

Mnium polytrichoides
Bryum undulatum.
Jungermannia lanceolata
. . . . tamariſci
Jungermannia epiphylla
Marchantia chenopodia
. . . . . . conica

North of the mountain beyond St. Julian's, going down to St. Maria del Giudice, the *Oxalis acetoſella* is found in great abundance.

On the mountains Bianco and Caſtellare.

Pinus ſylveſtris
Fagus caſtanea
Fraxinus ornus
Quercus robur
. . . . ilex
. . . . ſuber
Piſtacia lentiſcus
Myrtus communis
Juniperus communis
Lonicera periclymenum
. . . . . caprifolium
Olea ſylveſtris
Mentha pulegium
Erigeron graveolens
Ruſcus aculeatus
Ruta ſylveſtris
Thymus ſerpyllum
. . . . vulgaris
Agrimonia eupatoria
Viola odorata
Lathyrus latifolius
Orchis globoſa
Convolvulus Canthabrica
Campanula trachelium
. . . . medium
Cynogloſſum officinale
Hypericum perforatum
Arthemiſia abrotanum
Aſparagus acutifolius
Gallium verum
Teucrium chamædris
. . . . . polium

Clematis vitalba
Gentiana centaurium
Cuſcuta Europæa *epithymum*
Smilax aſpera
Orobanche major
Sonchus oleraceus
Aſplenium rutamuraria

Linum tenuifolium
. . . . flavum
Iberis ſaxatilis
Campanula rapunculus
Eringium campeſtre
Scilla bifolia
Daphne gnidium
Oxalis corniculata

Near the *Buche delle Fate*, or Mouths of the Fates.

Aſplenium ſcolopendrium
. . . . . . ceterach

Aſplenium trichomanes
Polipodium vulgare

From the mountain Bianco to Aſciano.

Ruſcus racemoſus
Ixia bulbocodium
Serapias cordigera
Polytrichum commune
Bryum apocarpum
. . . . ſtriatum
. . . . pomiforme
. . . . pyriforme
. . . . extinctorium
. . . . rurale
. . . . ſcoparium
Hypnum criſpum

Hypnum proliferum
. . . . . prælongum
. . . . . criſtacaſtrenſis
. . . . . ſericeum
. . . . . ſciuroides
Lichen ſcriptus
. . . . geographicus
. . . . calcarius
. . . . ericetorum
. . . . centrifugus
. . . . pulmonarius
. . . . ciliaris

Lichen puſtulatus
. . . . cocciferus
. . . . digitatus
. . . . pyxidatus

Lichen rangiferinus
. . . . ſubulatus
. . . . paſchalis

On the mountain Corliano, in its vicinity, and road from thence to the Baths.

Ilex aquifolium
Cornus ſanguinea
Tamus communis
Anthyllis tetraphylla
Saxifraga bulbifera
Turritis hirſuta
Lithoſpermum arvenſe
Cardamine impatiens
Melittis meliſſophyllum
Myagrum perfoliatum
Draba verna
Scorpiurus ſubvilloſa
Geranium moſchatum
Glecoma hederacea
Prunella vulgaris
Anagallis arvenſis
Veronica agreſtis
. . . . . arvenſis
. . . . . hederæfolia
Orobus vernus
Aira caryophyllea
Briza major

Briza minor
. . . virens
Poa bulboſa
Ranunculus muricatus
. . . . . . arvenſis
Ajuga reptans
Symphytum tuberoſum
Orchis maculata
. . . . morio
. . . . bifolia
. . . . conopſea
. . . . pyramidalis
Ophrys arachnites
. . . . myodes
Serapias longifolia
. . . . lingua
Melica cærulea
. . . . ciliata
Tragopogon Dalechampii
. . . . . . picroides
Scorzonera laciniata
Picris echioides

Oſyris alba
Campanula medium
. . . . . . erinus
Bromus mollis
. . . . ſterilis
. . . . ſquarroſus
Alopecurus agreſtis
. . . . . paniceus
Agroſtemma githago
Hyacinthus Romanus
. . . . . comoſus
. . . . . botryoides
Euphorbia eſula
. . . . . exigua
Daphne laureola
Cithyſus hirſutus
. . . . laburnum
Antirrhinum majus
Rhamnus alaternus
Geniſta candicans
Ornythopus compreſſus
Mnium ſerpyllifolium *punctatum*
Hypnum complanatum
. . . . cupreſſiforme
Jungermannia complanata
. . . . platyphylla

On the ditch banks about the Baths, and at Caldaccoli.

* Nymphæa alba
Rumex criſpus
. . . . pulcher
* Zannichellia paluſtris
* Valliſneria ſpiralis
* Feſtuca fluitans
Scrophularia aquatica
. . . . . . auriculata
* Potamogeton natans
* . . . . criſpum
* . . . . lucens
* Callitriche verna
* Lemna triſulca
* . . . . polyrrhiza
* Myriophyllum verticillatum
* Ceratophyllum demerſum
* Ranunculus aquatilis
. . . . . . ſceleratus
. . . . . . repens
. . . . . . bulboſus

* Aliſma plantago *aquatica*
Lychnis flos cuculi
. . . . dioica
* Scirpus Romanus
* . . . . paluſtris
Carex vulpina
. . . diſtans
. . . muricata
. . . veſicaria
. . . maxima
. . . Tuſſilago petaſſites
* Sium nodiflorum
Iris pſeudo-acorus
. . fœtidiſſima
* Siſymbrium naſturtium
* . . . . amphybium
* Menta aquatica
* Veronica beccabunga
* . . . . . anagallis
Veronica ſerpyllifolia
Samolus Vallerandi
* Gallium paluſtre
Gratiola officinalis
Centaurea galactites
Carduus nutans
* Chara vulgaris
Cyperus longus
Euphorbia platyphylla
. . . . . . peplus
Lycopus Europæus
* Hydrocotyle vulgaris
* Marſilea natans
* Hydrocheris morſus ranæ
* Equiſetum paluſtre
* Butomus umbellatus
Sagittaria ſagittifolia
Siſymbrium ſylveſtre
Bryum paludoſum
Hypnum riparium

Thoſe plants marked * are aquatic.

QUALITIES OF THE WATERS.

THE Water of the Baths riſes from the foot of the mountain St. Julian; its ſeveral ſources compriſe a ſpace of about ſeventy paces; they form altogether a large body of water, which is nearly the ſame in all ſeaſons. Some of the ſprings are within the Baths, theſe run conſtantly; others are without, they flow through pipes into the Baths at pleaſure. The moſt conſiderable of them, *La Maeſtra*, ſupplies the reſervoir, ſix large and ſix ſmall Baths, two Tub Baths, and the Douge.

The Bath of Mars contains full five hundred barrels of water: it is emptied every day; and ten hours fills it again.

The Baths form two compartments, the eaſtern and weſtern. The waters examined belonging to each are enumerated in the ſeveral experimental tables. They are all in a cool ſituation, limpid, colourleſs, and inodorous, except that of the long-neglected Bath of St. Julian, about two hundred yards from the general Baths, which has acquired impurities from accumulated filth and excluſion of air. This water was therefore well filtered, previous to its analyſis. The waters of the reſervoirs have, more than any of the others, a ſubacid ſaline flavour, though in a very ſlight degree: they are all more or leſs warm, as is ſhewn by the ſubſequent table, where alſo the comparative ſpecific gravity of each is exhibited, which ſuppoſes common cold water at 65 ½ of Fahrenheit's thermometer.

The cauſe of natural warm ſprings has of late times given riſe to much philoſophic argumentation. Some contend for ſubterraneous fires, others for the decompoſition of pyrites. The ingenious profeſſor, having ſaid much and well on the ſubject, is inclined to believe, that ſteel, and ſulphureous waters only owe their heat to pyrites; and that all aerated and ſaline waters obtain theirs either from ſhiſt, argillaceous earth, or magneſia. The Piſa waters then are warm from their ſhiſtous origin.

TABLE

Of the Temperature and Specific Gravity of the Waters of the Baths.

Fahrenheit's Thermometer being at 77.
The Barometer at 29,6.

The ſeveral Waters.	Specific Gravity.	Temperature.
Diſtilled Water	1,000	65 ½
Water of the Reſervoir of the Eaſtern Bath	1,125	106
Water of the Bath of Jupiter	1,107	101 ½
Water of the Bath of Mars	1,071	99 ½
Water of the Nerve Bath .	1,107	102 ½
Water of the Reſervoir of the Queen's Bath	1,107	99 ½
Water of the Hot Spring of the Queen's Bath . . .	1,107	99 ½
Water of the Temperate Spring of the Queen's Bath . .	1,107	92
Water of the Tub Bath, near the Queen's Bath, . . .	1,054	84
Water of the Tub Bath, No. 3, of the Weſtern Bath . .	1,107	104
Water of the Cold, or Jew's Bath	1,071	86
Water of the New Spring without the Weſtern Bath . .	1,107	92 ½
Water of a Spring in St. Julian's Field	1,125	68

Theſe Waters all depoſit a tartar upon the bottom and ſides of the Baths, upon the very brooms that clean them, or whatever comes in contact with them: the pipes through which they run, if not often cleaned, would be filled up with it. This incruſtation, from a thin pellicle, which forms in fourteen hours, will, by remaining undiſturbed on the ſurface of the Bath, become of ſo compact a nature in three or four days, that a ſmall bird may perch upon it, without breaking it: it is very white, earthy, and light. I am convinced it is compoſed of *quick*-lime ſtone and aerated magneſia. Expoſed to the ſun it acquires denſity much ſooner than in the ſhade.

By ſtanding open, the volatile elements of the Waters are inſenſibly loſt: they cool; and the aerial acid, aſſiſted by natural heat and by contact with atmoſpheric air, readily flies off. The marble ornaments of the Bath rooms, the calcareous earth and magneſia loſing this connecting principle, are no longer ſoluble in water, and therefore form a diſtinct incruſtating tartar. Hence we may readily conceive, how devoid of medical efficacy muſt be the water, when carried to any diſtance from the ſpring in veſſels, however well ſtopped. During the time of filling and corking a bottle the aerial acid will eſcape.

It has been idly credited, that if common cold water, and any warm mineral water, be placed upon the fire at the ſame time, the common cold water will boil ſooneſt, notwithſtanding the natural heat of the mineral water, which ought to advance it nearer the point of ebullition. The following experiment will refute this vulgar prejudice.

I expoſed, in ſeparate earthen veſſels, to an equal heat, reſervoir water of the bath, which raiſed the thermometer to 90 ½ Fahrenheit's ſcale, and common water of Piſa, which raiſed it to 68. The firſt boiled in 58 minutes, and the latter in 1 hour 12 minutes. I then took them from the fire, and expoſed them alike to cold; the firſt ſunk the thermometer to 68 in 1 hour 15 minutes, and the latter in 1 hour 2 minutes.

The experiment was often repeated, and the reſult was always the ſame. The tenacity of heat peculiar to the Piſa water muſt then be attributed to its ſaline and earthy combinations.

EFFECTS OF CHEMICAL TESTS.

IN theſe experiments, a few teſts only, and thoſe the moſt approved, were made uſe of. They were prepared for the purpoſe, not bought. The portions of the waters analyzed were equal, and rather conſiderable.

The annexed Table will ſhew the effects of the fifteen chemical teſts employed on the ſeveral waters, in the columns under each reſpectively.

TABL E PISA-BATH WATERS.

Nº	Water.	em- e f the Bath.	Of the Tub Bath near the Queen's Bath.	Of the Tub Bath, Nº 3, of the Weſtern Bath.	Of the Cold, or Jew's Bath.	Of the new Spring without the Weſtern Bath.	Of the Spring in St. Julian's Field.
1	Tincture of L		—	—	—	—	—
2	Lime Wa	me, rce i-	Faint White.	The ſame.	The ſame.	The ſame.	The ſame.
3	Paper ſtained w mus, and redde diſtilled Vineg		—	—	—	—	—
4	Paper ſtained wi meric.		—	—	—	—	—
5	Muriated Ba	me.	The ſame.	The ſame.	The ſame.	The ſame.	The ſame.
6	Ceruſe ſuperab acetated	me.	The ſame.	The ſame.	The ſame.	The ſame.	The ſame.
7	Nitrated Mercu abundantly ace	me.	The ſame.	The ſame.	The ſame.	The ſame.	The ſame.
8	Nitrated Si	me.	The ſame.	The ſame.	The ſame.	The ſame.	The ſame.
9	Vitriolic A		—	—	—	—	—
10	Fixt vegetable A diſtilled W	me.	The ſame.	The ſame.	The ſame.	The ſame.	The ſame.
11	Tincture of	me.	The ſame.	The ſame.	The ſame.	The ſame.	The ſame.
12	Saccharine A	me.	The ſame.	The ſame.	The ſame.	The ſame.	The ſame.
13	Volatile cauſtic	me.	The ſame.	The ſame.	The ſame.	The ſame.	The ſame.
14	Tincture of		—	—	—	—	—
15	Fixt phlogiſt Alkali.	me.	The ſame.	The ſame.	The ſame.	The ſame.	The ſame.

I draw the following inferences from the effects of theſe ſeveral teſts.

No. 1. Proves that the reſervoir water of the Eaſtern Bath only contains an evident portion of uncombined acid.

No. 2. That this acid is probably aerial acid; and that in all the waters there is a magneſious ſalt.

No. 3 and 4. That there is no uncombined alkali.

No. 5 and 6. That there is a quantity of vitriolic acid in combination.

No. 7 and 8. That in all the waters there is ſome combination of muriatic acid.

No. 9. That there is no barytes, either pure or combined.

No. 10 and 11. That all the waters have ſome compound earthy ſalts.

No. 12. That calx, either pure or combined, is preſent.

No. 13. That there is magneſia in combination, and no copper.

No. 14 and 15. That iron is totally abſent.

ANALYSIS BY EVAPORATION.

THE foregoing Table ſhews, that all theſe waters contain ſimilar principles; but in what proportion other experiments muſt determine. I choſe for ſuch experiments the water of the reſervoir and hot ſpring of the Queen's Bath.

Experiment 1.

I evaporated, in a pipkin of the beſt Engliſh earthen-ware, 100 pints of the reſervoir water. During the evaporation a pellicle formed on the ſurface, an incruſtation round the ſides of the veſſel, and a ſediment at the bottom. I now and then broke the pellicle to let the vapour paſs. When the whole had acquired ſome degree of ſpiſſitude, I continued the evaporation by a more moderate heat in the balneum mariæ, till a perfect dry reſiduum was formed. It was whitiſh, of a bitteriſh ſalt taſte, and weighed grains 2,388.

Experiment 2.

I poured ounces 18 of highly-rectified ſpirits of wine upon this reſiduum put into a glaſs veſſel, and ſtirred it with a glaſs rod. After ſtanding 12 hours, I ſtirred it again, and filtered it through paper. I then evaporated the filtered ſpirit in a glaſs veſſel, by a balneum mariæ. The reſiduum was conſiderably ſalt, and bitter: it attracted moiſture, and weighed grains 212.

Experiment 3.

Vitriolic acid dropt upon this ſalt cauſed an efferveſcence; and white fumes aroſe, which, from the ſmell, were manifeſtly muriatic acid. To a ſolution of this ſalt in diſtilled water I applied the following teſts, ſhewing their effects, and the inferences deduced.

TESTS.	EFFECTS.	INFERENCES.
Acid of Sugar diſſolved in diſtilled Water.	No alteration.	No Calx.
Cauſtic volatile Alkali.	Much White Precipitate.	Magneſia.
Nitrated Silver.	Much White Precipitate readily formed, and ſuddenly thrown down to the Bottom of the Veſſel.	Magneſia united with Muriatic Acid.

Experiment 4.

To know if the rectified ſpirit had let looſe any muriated natron from this muriated magneſious ſalt: I diſſolved grains 100 of it, well dried, in diſtilled water; I poured gradually into it a ſolution of pure natron in diſtilled water, till the mixture grew turbid, and precipitated. After ſtanding ſome time, I filtered it; and the earthy reſiduum in the filter weighed full grains 38. Then, making my calculations according to Bergman's rules, I found that about grains 94 of muriated magneſia were contained in grains 100 of this ſaline matter; conſequently grains 199 were contained in the whole grains 212 of the former proceſs. It follows, that the rectified ſpirit muſt have decompoſed grains 13 of muriated natron.

Experiment 5.

By an aqueous ſolution of this ſaline matter, and by ſlow evaporation, I have procured ſome cryſtals; which, from their cubic form, taſte, decrepitation on live coals, and muriatic fumes on the application of vitriolic acid, were clearly muriated natron.

Experiment 6.

What remained in the filter inſoluble in ſpirits of wine, when dried, weighed grains 3,175 (See Exp. 2). This I put in a glaſs veſſel, pouring upon it full ounces 30 of cold diſtilled water: I ſtirred it, let it ſtand 24 hours, and filtered it; I evaporated it in a glaſs veſſel by the balneum mariæ, and obtained a ſaline maſs of confuſed cryſtals, weighing when dried grains 780. I ſubmitted grains 18 of this matter to the following teſts; ſhewing their effects, and inferences.

TESTS.	EFFECTS.	INFERENCES.
Muriated Barytes.	Much White Precipitate.	Vitriolic Acid.
Acetated Lead.	The ſame.	The ſame.
Nitrated Silver.	White Precipitate readily formed and denſe.	Muriatic Acid.
Nitrated Mercury.	Yellowiſh White Precipitate.	The ſame.
Cauſtic volatile Alkali.	White Precipitate.	Magneſia—I once ſuſpected Argillaceous Earth.
Cauſtic fixt Alkali.	Much White Precipitate readily formed.	The ſame.

Vitriolated magneſia, muriated natron, and poſſibly vitriolated natron, may then be its component principles.

Experiment 7.

I diſſolved grains 60 of this cryſtalline maſs in diſtilled water, pouring upon it an aqueous ſolution of cauſtic natron, till it became turbid, and precipitated. After ſtanding 6 hours, I filtered the mixture, and there remained from grains 4 to 5 of pure magneſia in the filter, which form the baſe of about grains 25 of vitriolated magneſia. The grains 780 then of the above cryſtalline maſs contained grains 325 of vitriolated magneſia.

Experiment 8.

Wiſhing to know what quantity of vitriolated and of muriated natron this maſs contained, I diſſolved grains 200 of it in a large portion of water, adding a quantity of powdered lime-ſtone to it: I ſhook the mixture, let it ſtand 6 hours covered, and filtered it. The lime-ſtone decompoſed the vitriolated magneſia, precipitating its baſis, and combining with the vitriolic acid. Any remaining lime-ſtone that might be in the filtered ſolution, I precipitated with aerial acid decompoſed from calcareous ſpar by means of vitriolic acid; thus rendering it inſoluble in water. I left it 24 hours expoſed to the air, and again filtered it.

Thus for a vitriolated magneſia I ſubſtituted a ſelenite, which, by reaſon of its inſolubility in water, might partly have remained in the firſt filter; I therefore edulcorated it ſeveral times with boiling water. This inſolubility afforded me the means of ſeparating the ſelenite from the whole cryſtalline maſs.

Experiment 9.

For this purpoſe I evaporated to dryneſs the filtered ſolution; I poured upon the ſaline maſs eight times its weight of cold diſtilled water; I ſtirred the mixture; and, after ſtanding 6 hours, filtered it. The dried inſoluble ſelenite then remaining in the filter weighed grains 59 ¾, which contained grains 27 ½ of vitriolic acid; which grains 27 ½, taken from ſelenite, and transferred to a baſe of magneſia, prove the quantity of vitriolated magneſia to have been grains 83 ⅓ in grains 200 of the ſaline maſs; or grains 325 of vitriolated magneſia in the whole grains 780 of the ſaline maſs.

Experiment 10.

Acid of ſugar, applied to the filtered ſolution of *Experiment* 3, gave no ſign of the preſence of calx; for which reaſon, it could only contain vitriolated and muriated natron. To ſeparate theſe, I put to the ſolution grains 200 of pure barytes in powder, ſtirring it, and filtering it after ſtanding 12 hours. The barytes would attract the vitriolic acid, forming a vitriolated barytes, which, from its inſolubility, muſt remain in the filter, together with the ſuperabundant pure barytes.

Experiment 11.

Upon the earthy reſiduum taken from the filter I poured nitrous acid, till all effervеſcence and ſolution ceaſed. I ſtirred the mixture, let it ſtand, and filtered it: the earthy reſiduum, that is vitriolated barytes, when edulcorated and dried, weighed grains 108, which of courſe contained above grains 14 of vitriolic acid. There is then the vitriolated natron, whoſe quantity in grains 200 of the ſaline matter may be valued at grains 52, which grains 52 contain grains 14 of vitriolic acid: there are therefore grains 203 of vitriolated natron in grains 780 of the ſaline maſs.

The filtered ſolution then, after the addition of barytes, ought to contain natron freed from its vitriolic baſe, and muriated natron.

Experiment 12.

To detect which, I poured a ſolution of muriated calx in diſtilled water upon the filtered ſolution, till it became no further turbid, or precipitated. I let the mixture ſtand, and then filtered it. The reſiduum conſiſted of upwards of grains 13 of a calx precipitated from the natron exiſting in the ſolution: ſo that the natron had decompoſed grains 31 of muriated calx, and had combined with full grains 9 of muriatic acid, with which it had formed grains 18 of muriated natron.

Moreover, as grains 7 of natron form the baſe of grains 18 of muriated natron, it is an additional proof, that in grains 200 of the ſaline maſs there muſt be grains 52 of vitriolated natron.

Experiment 13.

Upon this laſt filtered ſolution I dropt an aqueous ſolution of natron, ſo long as the mixture whitened, in order to decompoſe any remaining muriated calx. I then filtered and evaporated it. The reſiduum after evaporation I ſubmitted to the neceſſary analyſis, and it proved to be muriated natron. Having finally extracted from the grains 200 of the ſaline maſs all its vitriolated magneſia and vitriolated natron, I found that it contained full grains 64 of muriated natron; ſo that the whole ſaline maſs of grains 780 muſt contain grains 252 of muriated natron; which, added to the grains 13 more, that the rectified ſpirit had diſſolved, ſhews that the amount of muriated natron contained in the reſiduum of 100 pints of the water, is grains 265.

Having endeavoured to ſhew the qualities and quantities of the ſaline principles of theſe waters, let us inveſtigate the inſoluble

luble reſiduum, which, taken from the filter, weighed grains 1,395.

Experiment 14.

I boiled grains 288 of this reſiduum well powdered in 21 pints of diſtilled water, to free it from any vitriolated calx, and filtered it. This liquor (which a ſmall portion of ſaccharine acid rendered milky) on evaporation gave grains 200 of vitriolated calx: the earthy matter in the filter weighed grains 88. The grains 1,395 of inſoluble reſiduum muſt then contain grains 969 of vitriolated calx.

Experiment 15.

To the grains 88 of earthy matter, I poured diſtilled vinegar, to free it from any calx or magneſia. When the effervеſcence had ceaſed, I added ſuperabundant acid, let it ſtand 4 hours, and filtered it.

What remained in the filter, edulcorated and dried, weighed grains 12.

Experiment 16.

In this ſolution, diluted with diſtilled water, I dropped 3 drops of vitriolic acid; neither whiteneſs or precipitation enſued; conſequently, it contained no barytes. The earthy matter decompoſed then was either calx, or magneſia, or perhaps both.

Experiment 17.

To determine this, I dropped ſome cauſtic volatile alkali into the foregoing ſolution; it became ſuddenly white, and grew more ſo on filtration, and on ſtanding 24 hours; the remains of the filtration was magneſia, and weighed grains 18. The grains 88 of earthy matter yielding grains 18 of magneſia, the whole maſs of inſoluble reſiduum, of grains 1,395, muſt contain grains 87 of

magneſia:

magneſia: for, taking away its grains 969 of vitriolated calx, its earthy matter is grains 426.

Experiment 18.

Upon the ſolution laſt filtered I poured fixt vegetable alkali diſſolved in diſtilled water: it became milky: I filtered it after ſome time. What remained in the filter was calx, and weighed grains 58. The grains 88 of earthy matter yielding grains 58 of calx; the whole maſs of inſoluble reſiduum (whoſe portion of earthy matter is grains 426) muſt contain grains 281 of calx.

Experiment 19.

I thus analyſed the grains 12 of produce from Exper. 15. I poured muriatic acid upon it; after two hours added a little diſtilled water, and filtered it. I found in the filter grains 2 ½ of ſiliceous earth, which I ſubmitted to the following teſts, marking the reſult.

TESTS.	EFFECTS.
Saccharine acid -	No alteration.
Volatile cauſtic alkali	White flocculi.
Phlogiſticated fixt alkali	A precipitate conſtantly white.

I dropped a little volatile cauſtic alkali into the ſolution, before I put in the ſaccharine acid, to ſaturate any exceſs of muriatic acid, which might prevent the action of the ſaccharine.

The abſence both of calx and iron is then evident. The grains 9 ½ of remaining earth, diſſolved in the muriatic acid, and precipitated by the alkalies, was argillaceous earth, which I combined with vitriolic acid, and formed a pure alum. So that the whole of the earthy matter contained grains 46 of argillaceous earth, and grains 12 of ſiliceous.

The quantity of aerial acid in theſe waters remains to be conſidered.

I filled a glaſs matraſs with 4 pints of the reſervoir water, ſtopped it cloſe; then, placing it upon the fire, with all due precaution, and by means of a proper apparatus, I expoſed a certain portion of lime-water to the fixt air, which fled off by the neck of the unſtopped matraſs: the lime-water, which became milky as the air aroſe, I frequently ſhook in its veſſel, to expoſe a conſtant freſh ſurface of it to the fixt air. Immediately as I perceived that the water in the matraſs began to acquire a milky caſt, and before it boiled, I removed it from the fire; and then filtered all the lime-water, which gave me grains 22 of calcareous earth. Conſequently, 4 pints of this reſervoir water contain nearly grains 7 ½ of uncombined aerial acid; or, 100 pints of it contain grains 187. Had I kept the matraſs longer on the fire, the aerial acid of the calx and aerated magneſia would have eſcaped; and they, thus loſing their ſaline quality, and becoming inſoluble, would have rendered the water under analyſis turbid and white. The quantity of aerial acid decompoſed would alſo have exceeded that juſt uncombined proportion, which gives the water its natural acidulous freſhneſs.

We will now enumerate from experiment the ſeveral proportionate contents of 100 pints of the reſervoir water.

Aerial acid uncombined	-	- Gr.	187
Vitriolated natron	-	-	203
Muriated natron	-	-	265
Vitriolated calx	-	-	969
Vitriolated magneſia	-	-	325
Muriated magneſia	-	-	199
Lime-ſtone	-	-	281
Magneſia alba, *not calcined*		-	87
Argillaceous earth	-	-	46
Siliceous earth	-	-	12

It ſhould be remarked, that in the ſummer, and in dry weather, theſe principles are all found to be in rather larger proportions than in other ſeaſons, or after heavy rains.

WATER OF THE WARM SPRING OF THE QUEEN'S BATH.

THIS Water was analyſed by the ſame methods as the preceding, from which it differs only in the proportion of its contents, and the abſence of aerial acid, of which it does now and then give ſome ſlight ſigns.

Contents of 100 *Pints.*

Vitriolated natron - -	Gr. 186
Muriated natron - -	260
Vitriolated calx - -	905
Vitriolated magneſia - -	278
Muriated magneſia - -	179
Lime-ſtone - -	204
Magneſia alba, *not calcined* -	44
Argillaceous earth - -	34
Siliceous earth - -	10

The other waters of the baths have all ſimilar qualities, but diſſimilar quantities.

OF THE PELLICLE, AND TARTAR OF THE WATER IN THE BATHS.

Experiment 1.

OF this tartar powdered, and thoroughly dried by the fire, I diſſolved grains 100 in ſome diſtilled vinegar, which I then diluted with water. After ſtanding ſome hours, I filtered it: grains 5 of an earth remained in the filter; which, not diſſolving in muriatic acid, was, I preſume, ſiliceous.

Experiment 2.

Upon the filtered ſolution I poured cauſtic volatile alkali newly prepared: a turbid appearance of a pale yellow took place, and gradually formed a precipitate: after ſome hours I filtered it; the matter left in the filter became whiter when dry; it was pure magneſia, weighing grains 15.

Experiment 3.

Pouring at intervals a ſolution of fixt alkali in diſtilled water upon the filtered liquor, after the effuſion of volatile alkali, a copious white precipitate ſuddenly formed, rendering the ſolution perfectly white. When it had ſtood, and the fixt alkali cauſed no further change, I filtered it: the remaining earth in the filter, which was certainly calx, weighed grains 80.

Experiment 4.

Still further to aſcertain the exact quantity of magneſia, I diſſolved in nitrous acid grains 100 of the bath water tartar; I poured lime-water upon the ſolution, it became turbid and white; by degrees a ſediment was formed, which, when edulcorated and dried, weighed about grains 15. This corroborates *Experiment* 2.

I made ſimilar experiments on the ſpontaneous pellicle of the water in the baths; the nature of the products was the ſame, but the quantities of them differed in the following comparative ratio:

Grains 100 of Tartar.		Grains 100 of Pellicle.
Gr.	PRODUCED	Gr.
80	Calcareous earth	86
15	Magneſia	11
5	Siliceous earth	3

The calcareous earth prevails rather in the pellicle; magneſia and ſiliceous earth in the tartar.

To account for this earthy depoſition, we will believe that originally its calx and magneſia were intimately combined with the water. Theſe, poſſeſſing a ſuperabundance of aerial acid, acquired the properties of ſalts. The heat of the water, a free communication with atmoſpheric air, and the inſufficient tenacity of its earthy baſe, now ſuffer the aerial acid to eſcape. The calx and magneſia, loſing that exceſs of acid which conſtituted their ſaline form, become inſoluble in water, and are precipitated, ſwimming on the ſurface, or ſinking, according to the bulk, denſity, and ſpecific gravity of their particles.

This is plauſible: but perhaps we ſhould come nearer the truth, if we attributed this depoſition to magneſia alba, *not calcined*, and calx, which, by reaſon of their extreme tenuity, are, together with the ſmall portion of ſilex, readily ſuſpended in water ſo long as it has heat and motion; but when that water is at reſt, and grown cold, theſe earthy particles accumulate by attraction, forming the pellicle and tartar.

ON THE ACIDULOUS WATER OF ASCIANO.

SITUATION OF THE SPRING.

TWO miles and a half eaſt of the Piſa baths, paſſing by a pleaſant road at the mountain's foot, through the valley of Aſciano, and near the great aqueduct of the town, you come to a prolongation of the mountain Colle, which, advancing into the plain, takes the name of Monticello; at its extremity ariſes the acidulous ſpring of Aſciano.

It is within an humble building, and forms a kind of well nearly level with the ſurface of the ground, which is covered over with a ſtone. Two ſmall baths adjoining are ſupplied from it; but they are in diſuſe, on account of the extreme frigidity of the water.

This long-neglected ſpring was about forty years ſince introduced to notice by Dr. Barzanti, of Piſa, who had in many caſes experienced good effects from its water. It was in conſequence covered in; and its repute is now ſuch, that it is ſent in bottles over all Tuſcany, and even into foreign countries.

In 1757, Bartolommeo Meſny publiſhed his analyſis of the water, after the manner of Hoffman and Duclos. Had it been ſatisfactory, I might have been ſpared the trouble of making another, which the intereſting nature of this ſpring ſeemed to require.

PROPERTIES OF THE ASCIANO WATER.

AT its ſource it is limpid, and colourleſs. It has a ſlight pungency of ſmell, not unpleaſing, and a ſouriſh taſte, at firſt agreeably ſharp, then becoming ſomewhat ſaline: theſe qualities diminiſh in the winter, or when rains have rendered the water more dilute.

Its ſpecific gravity is to that of diſtilled water as 1,143 to 1,000. It is cold in the ſummer; and ſince it has been covered in, I have found it ſomewhat warm in the winter. My thermometer, which in the open air ſtood at 59, when it approached the ſurface of the water roſe to 63 ½, and when immerged in the water to 65 ½. On ſtanding it yields a tartarous incruſtation, and pellicle of the ſame nature with thoſe of the Piſa-bath waters.

The water is about 20 inches below the mouth of the reſervoir, in the pavement which includes the ſpring. Holding my head over and within it, I was ſenſible of the ſame ſuffocating vapour which I have felt ariſing at eight or ten inches from the earth in the *Grotta del Cane*, near Naples. This exhalation does not extend quite ſo far as the mouth of the reſervoir.

Experiment 1.

A lighted candle, let down within about ten inches of the water, burnt feebly; and, carried near to the ſurface, was extinguiſhed.

Experiment 2.

A ſmall bird held at the ſame diſtance from the water ſhewed ſigns of approaching death; brought into the open air, it recovered, and fled away.

Experiment 3.

An unſtopt phial of tincture of litmus, held within the vaporous atmoſphere of the water, and ſhook, became red.

Experiment 4.

Very clear lime-water, expoſed to the vapour in the ſame manner, became milky, and threw down its calcareous earth; but, ſhaking the bottle, it by degrees re-aſſumed its tranſparency.

Such experiments ſufficiently prove this exhalation to be aerial acid.

EFFECTS OF CHEMICAL TESTS ON THE ASCIANO WATER.

TO diſcover its component principles, I ſubmitted it to the ſame teſts as the Piſa-bath water. The following were their effects:

TESTS.	EFFECTS.
Tincture of Litmus.	Sudden bright Red.
Lime Water.	Much White.
Paper ſtained with Litmus, and reddened with diſtilled Vinegar.	
Paper ſtained with Turmeric.	
Muriated Barytes.	White.
Ceruſe ſuperabundantly acetated.	Much White denſe Precipitate.
Nitrated Mercury ſuperabundantly acetated.	Yellowiſh White Precipitate ſuddenly formed.
Nitrated Silver.	Sudden copious White Precipitate.
Vitriolic Acid.	
Fixt Vegetable Alkali in diſtilled Water.	Sudden copious White Precipitate.
Tincture of Soap.	Much White diſunited Precipitate.
Saccharine Acid.	White Precipitate ſuddenly formed.
Volatile cauſtic Alkali.	The ſame.
Tincture of Galls.	
Fixt phlogiſticated Alkali.	No Blue.

Theſe effects prove, that the water contains aerial acid uncombined, vitriolic and muriatic acid in combination, alſo compound earthy ſalts. The properties and proportions of theſe we will next ſhew.

ANALYSIS BY EVAPORATION OF THE ASCIANO WATER.

PREVIOUS to the evaporation, we will determine the quantity of the aerial acid.

By means of the ſame apparatus with which I examined the Piſa-bath waters, and of lime-water, I examined four pints of this acidulous ſpring. So much aerial acid was evolved, that the lime of the lime-water, precipitated in the form of an inſoluble *calcareous earth*, weighed grains 41. Four pints then of the Aſciano water contain nearly grains 14 of looſe uncombined aerial acid. Or, in 100 pints of it there are grains 348 ½. I would remark, that the water drawn from the pipes that ſupply the little baths of Aſciano, contains leſs of aerial acid than what is taken from the reſervoir of the ſpring.

After evaporating 100 pints of this water, the reſiduum weighed grains 2,206, containing all thoſe ſubſtances it held in ſolution in the following proportions.

Uncombined aerial acid	-	Gr. 374
Vitriolated natron	- -	312
Muriated natron	- -	338
Vitriolated calx	- -	654
Vitriolated magneſia	- -	275
Muriated magneſia	- -	177
Lime-ſtone	- -	294
Magneſia alba, *not calcined*	-	109
Argillaceous earth	- -	38
Siliceous earth	- -	9

There is clearly ſome analogy between the Aſciano water and the Piſa-bath water: but the Aſciano is cold, and abounds with aerial acid; it holds in ſolution a larger portion of ſalt, if we except the vitriolated calx; it is even equal to that of the new reſervoir of the baths, which is the moſt abundant in principles.

OF THE COMMON SPRING WATER OF PISA, AND OF THE BATH FOUNTAINS.

ALL waters uſually drunk, though eſteemed pure, are neverthelesſs loaded with heterogeneous ſubſtances, according to the nature of which they are grateful and ſalubrious, or the contrary. The proportionate goodneſs of ſuch is always an intereſting object of inquiry. It may be to the purpoſe then, if we give ſome analyſis of thoſe waters, which are adopted for general uſe at the baths of Piſa.

There are two kinds of water uſed in common for drinking: that of the fountains in the ſquare, which, iſſuing from the foot of the mountain Caldaccoli, is conveyed by pipes to the baths; and that of the Piſa fountains, which is in fact daily brought from Piſa to the baths. The latter is light and pleaſant, making no depoſit: the former is thick and unpleaſant, incruſtating and depoſiting a ſediment in proportion as it is kept.

The effects of teſts on each are ſhewn in one comparative view.

Teſts.	Piſa Spring Water.	Piſa Bath Water.
Tincture of Litmus.		
Lime Water.	— —	White.
Paper ſtained with Litmus, and reddened with diſtilled Vinegar.		
Paper ſtained with Turmeric.		
Muriated Barytes.	— —	Much White.
Ceruſe ſuperabundantly acetated.	Faint White.	Copious White Precipitate readily formed.
Nitrated Mercury ſuperabundantly acetated.	— —	Yellowiſh White Precipitate.
Nitrated Silver.	Very faint White.	White Precipitate.
Vitriolic Acid.		
Fixt vegetable Alkali in diſtilled Water.	— —	White Precipitate.
Tincture of Soap.	Faintiſh White.	The ſame.
Saccharine Acid.	— —	White.
Volatile cauſtic Alkali.	— —	White Precipitate.
Tincture of Galls.		
Fixt phlogiſticated Alkali.	No Blue.	No Blue.

Hence it appears, that the water of the bath fountains has diſſolved in it vitriolic and muriatic ſalts, whoſe baſes are calx, magneſia, and perhaps natron. The calcareous incruſtation at the ſame time plainly indicates a mixture of aerated calx and magneſia.

Twenty pints gave me by ſlow evaporation a reſiduum weighing grains 239, which makes grains 1,195 in 100 pints. I made no further experiments upon the water, as it was analogous to that of the baths, differing only in temperature and the ſmaller proportion of its principles in ſolution.

It is then inefficacious as a bath, and dangerous to drink, particularly where the ſtomach is weak. The water of the Piſa fountain, on the other hand, diſcovers very ſmall portions of vitriolic or muriatic ſalts, and thoſe are of an earthy baſe. Pints 100 of this water evaporated afforded but grains 60 of reſiduum, which conſiſted of vitriolated and muriated magneſia, vitriolated calx, a little muriated natron, and barely an atom of argillaceous and ſiliceous earth. A pint of the water neceſſarily contains of heterogeneous matter only gr. $\frac{3}{5}$.

This Piſa water is therefore the moſt pure, limpid, and grateful, of any I ever taſted or examined.

The Piſans alſo drink certain well waters, drawn from a ſoil partly marſhy, partly ſabulous; ſuch waters muſt be impure, and will occaſion obſtructions, dropſies, ſwelled legs, and a wan complexion.

Conſulting therefore the good of his ſubjects, Ferdinand I. of worthy memory, began a noble aqueduct, whoſe arcades extend five miles, which was finiſhed under Coſmo II. to convey to Piſa the water from ſeveral ſprings in the declivity of the Aſciano mountain. To this water we may attribute the wholeſome looks of our natives; and it is owing to this water that even the inhabitants of mountainous countries maintain their health, coming to the more low and damp ſituation of Piſa:

We have many ſituations on the Mediterranean coaſt, whoſe inſalubrity is wrongfully attributed to the air; whereas it oftener ariſes from the waters in uſe loaded with poiſonous inſects, and other noxious matter. Many of theſe ſituations might be rendered healthy, were they ſupplied with a water like that of Piſa.

Whoever viſits theſe baths ſhould drink the water of the Piſa fountains; and never, by reaſon of its proximity, be tempted to uſe the unſafe water of the fountains of the ſquare.

MEDICINAL VIRTUES OF THE PISA-BATH WATERS.

MOST mineral waters have had their panegyriſts, who have attributed more virtues ties and more cures to them than they ever poſſeſſed or performed. Theſe writers, diſregarding truth and the general good, claim no public gratitude; they ought to have exhibited alike the merits and demerits of their waters. Yet ſome of theſe err innocently, blinded by partiality, and urged by the love of writing and of fame. But their indiſcreet eulogy often defeats its own purpoſe: by perſuading us to believe too much, we become ſuſpicious, and believe nothing.

Such panegyriſts the Piſa waters have had: I will not ſcrutinize into their deſerts; but proceed to mention thoſe general diſorders to which they ſeem adapted, from the obſervations of experienced phyſicians, that the invalid at a diſtance may form ſome idea how far they apply to his caſe.

The thermal waters of Piſa rank among the ſaline: they are exhibited internally by drinking them, or by way of injection; and externally by immerſion, or the douge.

The water in the reſervoir, ſituate in the middle of the eaſtern bath, is adapted for internal uſe: though warm, it does not nauſeate, even drunk largely: its aerial acid renders it exhilarating and antiſeptic; it is a gentle attenuant, incides, and clears away the ſharp viſcid humours of the firſt paſſages; it is cleanſing, detergent, and anthelmintic. It pervades the minuteſt veſſels, gives tone to the ſolids, moderates the circulation; it alſo promotes perſpiration and urine, which laſt, if crude and clear, it renders properly ſedimentous.

It is conſequently uſeful where the inteſtines are ulcerated, abound with ſordes, or with any of the cauſes of obſtinate diarrhœa and dyſentery: alſo, in lienteric and cœliac affections, where the meyſenteric glands are obſtructed, or any of the abdominal viſcera; and it mitigates the concomitant febrile ſymptoms. It effectually cures jaundice, and diſſolves gall-ſtones; it expels gravel and ſtony concretions. It relieves, and has cured, iſchury, diabetes, gleets; alſo, ulcers of the kidneys and urinary paſſages. It allays pains in the ſtomach, with exceſſive vomitings; and for chloroſis it has proved a certain remedy.

In drinking this water, its virtues are in many diſeaſes heightened by partial injections of it at the ſame time; for, by thus coming in immediate contact with the affected parts, it muſt have greater efficacy than when it reaches them changed and combined with the animal juices. This applies to ulcers in the rectum, bladder, and womb, fluor albus, hæmorrhoidal ulcers, periodical colic, dyſentery, and habitual diarrhœa.

But more frequently uſeful are theſe waters as general or partial baths; their good effects as ſuch have been long known, but not till lately much underſtood. Our inveſtigation of the lymphatic ſyſtem explains to us how readily any fluid applied to the ſurface of the body is taken up and carried into it by the infinite and minute mouths of the lymphatic veſſels. Hence we may readily conceive how preferably immerſion acts in many diſorders.

The water thus introduced into our ſyſtem by the lymphatics moſt intimately pervades it, dilutes and corrects the acrimony and impurities of its humours, removes any ſtagnant or obſtructed fluids, promotes circulation, aſſiſts the ſecretions and excretions, and gives the ſolids their due moiſture and fulneſs.

The diſeaſes which the Baths are found to relieve, are principally rheumatiſm, gout, periodical head-aches, pains over the eyes, convulſions, hypochondriac and hyſteric affections, palſy, weakneſs of the joints, rickets, white ſwellings, jaundice, ſcurvy, tinea, herpes, and old ulcers.

The douge effects the reſolution of ſtagnant humours, particularly if external; it re-produces action in debilitated indolent parts; quickening circulation through them, and it cleanſes wounds.

This has been accounted for upon the mechanical principle of percuſſion alone: but the warmth and ſaline particles of a water, thrown thus forcibly upon the mouths of the abſorbent veſſels, cannot be void of efficacy. Yet, ſo mild are theſe ſalts, and the temperature of the waters, that we may ſafely preſcribe their uſe to the moſt delicate and ſenſible habits.

A few words remain to be ſaid on the medicinal virtues of the acidulous water of Aſciano.

It acts powerfully upon the animal œconomy by reaſon of its aerial acid, its ſalts, and its degree of cold. It has many of the valuable qualities of the Piſa-bath waters, but its uſe is limited to the drinking of it. It is exhilarating, antiſeptic, attenuating, and aperitive. It more eſpecially aſſiſts both the ſecretion and expulſion of urine.

It is detergent, and its aerial acid and frigidity render it ſtomachic and tonic. It is then particularly adapted to hypochondriac affections, and pains of the head; to expel the ſordes of the primæ viæ, and correct their putrid cauſes; to iſchuria, diabetes, ſtone or gravel, and to complete the cure of a gonorrhœa; to cleanſe and cicatrize ulcers of the inteſtines, and urinary paſſages; to ſtrengthen the ſtomach, and the ſolids in general; and, like all other ſuch acidulous waters, it is an approved remedy in the gout, which the obſervations of Hoffman, and of ſome ingenious foreign phyſicians of our own times, partly confirm.

This cold acidulous ſpring is by ſo much the more valuable, as it is in the vicinity of the warm thermal waters: for it is often found ſerviceable to join to the external uſe of the one the internal uſe of the other; or at leaſt the Aſciano water ought to terminate the cures of the Piſa-bath water, in order to reſtore that tone of the ſtomach, which continued warm bathing will more or leſs diminiſh. And ſuch tonic water drunk at its ſource is ſurely to be preferred; although it has been found perfectly good, after remaining ſix months in bottle, with a refined cork, and kept in the cool.

I ſhall not dwell longer on the medicinal properties of theſe waters. What I have ſaid of them, as a chemiſt, may poſſibly induce the practical phyſician to apply them in other diſeaſes than thoſe I have enumerated.

The neceſſary directions and regimen to be obſerved, under a courſe of the Piſa or Aſciano waters, ought certainly to be obtained, before the unexperienced invalid ventures upon the uſe of them; but, with the proper cautionary inſtructions, I would venture to ſay, *I pede fauſto, grandia laturus præmia.*

HISTORICAL SKETCH

OF THE

TOWN OF PISA;

WITH A

METEOROLOGICAL ACCOUNT

OF ITS WEATHER.

HISTORICAL SKETCH

OF THE

TOWN OF PISA.

THE ancient town of PISA, ſituate in 43° 36′ of N. latitude, was founded by a colony of Arcadians from the Peloponneſian diſtrict of Piſa in Elis; who, tired of the country's wars, retired hither under their leader Pelops, and built a city.

It was ſubjected to the Roman empire, A. U. 558, and it ever maintained a good correſpondence with its mother country, as a warlike nation. Cæſar called it his military colony: and Auguſtus gave it the title of *Julia obſequens*. On the declenſion of the Roman empire, it became a powerful republic, and was the great emporium of all the Mediterranean commerce.

But it acquired its higheſt pitch of republican luſtre A. D. 935. The Genoeſe, in their conteſts with the Aſiatic pirates, often ſought refuge in the towers of Piſa, of which they reckoned up 10,000, each belonging to a noble family. In 1102 it was walled round. The Piſans are ſaid to have diſtinguiſhed themſelves in the conqueſt of Jeruſalem: one Coſcetto, a Piſan, having firſt mounted the breach of its walls. And the archbiſhop Dagobert in 1099 was choſen patriarch of Jeruſalem.

In 1284 Piſa was conquered by the Genoeſe, after a deſperate and deciſive naval engagement, in which the celebrated count Ugolino commanded.

In October 1406 it ſubmitted to the Florentines, whoſe dominion the Piſans ſtill ſpurn in ſecret; notwithſtanding the paternal rule of the Medicean family, and the lenient ſway of the ſucceeding grand-dukes of the houſe of Auſtria. The Florentine families pretend to this day, that the Piſans ſcarce maintain cuſtomary ſocial civilities towards them.

Piſa is now far leſs populous than heretofore; its inhabitants, from the average of many calculations, not exceeding 16,500. It has no longer any commerce to ſupport it: formerly it was famous for the building of boats, with which it ſupplied all the maritime ſtates of Italy. In later times it excelled in poliſhed ſteel work; and one or two Piſan artiſts ſtill maintain that trade. Almoſt every travel-writer, injudiciouſly copying from Smollet, tells us, that the town is ſo deſerted, as to allow of graſs growing in the ſtreets: I have never ſeen any worth remark. Do not ſome ſcanty blades grow in many ſpacious, or in many neglected parts of London?

The river Arno runs through Piſa nearly from eaſt to weſt, and its quays are the handſomeſt I know; but we feel a regret in their not being commercial. The quay, expoſed to the ſouth is a very buſy ſcene; it is the ſunny walk of the idle, and in gala days it is the corſo for carriages. There are ſeveral good habitations upon it; and it is the ſituation an invalid ſtranger ought more particularly to chuſe.

There are three bridges over the Arno: the center one, which is of marble, is eſteemed handſome, yet it has a dirty appearance. Marble buildings have by no means that beauty generally ſuppoſed: expoſure to air ſoon diſcolours them.

The battle of the bridge, ſo celebrated in Piſan ſtory, takes place on this marble ſtructure. Some refer its origin to the Olympic games of Grecian Piſa: the cuſtom is, however, traced back to the tenth century: it was once annual, then triennial, and now it is a feſtival nearly aboliſhed. It was meant to keep alive the martial independent ſpirit of the Piſans. A barrier is placed in the centre of the bridge: the combatants of the Santa Maria ſide of the Arno, and thoſe of the St. Antonio ſide, in general ſtout countrymen, armed with bludgeons, and defended with cuiraſſes and helmets, diſpute the paſſage of the bridge; the conteſt is often ſevere, and coſts many broken heads: the victorious ſide feaſts the town for ſeveral days, and the expence is defrayed by a public collection.

Piſa boaſts no palaces, ſculptures, pictures, or buildings of note, except that little cluſter of four diſtinct edifices, which well deſerves obſervation, and which the *calendrier* of the town accurately deſcribes; I mean the cathedral, its baptiſtery, its belfry or leaning tower, and its antient burial-ground, or campo ſanto: theſe we ſhall preſently mention. The grand-duke's palace is rather the habitation of a private perſon; it has few decorations; ſome of the arabeſque ceilings have merit. The churches contain ſcarce any thing worthy of notice: in that of St. Mathew is a picture by Pietro da Cortona, of the ſellers driven from the temple; and its ceiling, painted by the brothers Melins, deſerves remark.

In the midſt of the town is a neglected old tower, where, they ſay, count Ugolino was confined with his ſons and nephews, accuſed of betraying Piſa to the Genoeſe. Sir Joſhua Reynolds' juſtly celebrated picture has perhaps contributed more to the intereſt of curioſity reſpecting this tower, than all its mention in poetry or hiſtory.

The theatre of Piſa is rather handſome as an edifice; it is ill attended, and I never ſaw a good troupe on its boards.

Piſa has ſome pleaſant rides and excurſions about it, notwithſtanding the country is flat. As a morning ride, you may go on the Leghorn road, alſo to the Baths four miles diſtant, and to the *Caſcina*, or royal dairy, about three miles; at this laſt place the curious may remark the camels, which are bred there, and which carry the grand-duke's wood, from which he receives a vaſt revenue, to the town of Piſa, where it is lodged in warehouſes for ſale. Buffalos alſo you will ſee are greatly employed in his agriculture and draft work. From the Caſcina you may extend your ride about four miles further to the ſea-ſide, through a fine pine-wood. For more extenſive excurſions, you may go to the Carthuſian convent, pleaſantly ſituate on a hill ſeven miles from Piſa. By previouſly informing the ſuperior of your viſit, you are entertained after eleemoſynary cuſtom, and fare ſumptuouſly; it being a tenet of the inſtitution to receive the ſtranger hoſpitably: the revenue of this convent is about £. 4,000 ſterling per annum. The commercial chearful city of Leghorn is another pleaſant excurſion, fourteen miles diſtant only: in this town the ſea-coal fire reminds you of England. Lucca, fourteen miles alſo from Piſa, is a moſt romantic ride, either under the mountains paſſing by the Baths, or over them: I would adviſe going over the heights to Lucca, as you then command a novel view of the Luccheſe territory; and returning home under the mountains, or by the lower road. Florence, forty-eight miles from Piſa, through a flat country, or rather through a rich vineyard, will delight the rambler of amuſement; the road is like a garden path, and you may return from Florence to Piſa through Prato, Pictoïa, Peſcia, and Lucca, which in the ſpring is a country of enchantment.

Piſa has an univerſity founded by count Bonifazio Novello della Gherardeſca; and pope Clement VIth granted it certain immunities. It has forty-five profeſſors, who read lectures daily on their reſpective ſciences in Latin, and ſome of them repeat theſe lectures in an evening to the ſtudents familiarly in their vernacular language. Among the preſent profeſſors are men of much worth, particularly the head of the univerſity, Monſignor Fabroni, whoſe ſuavity of manners endears him to his acquaintance, and whoſe informations, particularly in what reſpects hiſtorical anecdote, muſt be valued by every admirer of the belles-lettres: there is alſo the naturaliſt, profeſſor Santi, whoſe merit the ſubſtance of the preſent pamphlet ſufficiently proclaims; nor ſhould we omit the elegant Italian fabuliſt Lorenzo Pignotti. The medical profeſſors, and the ingenious anatomiſt Catellacci, claim a due ſhare of praiſe.

The inſtitution of the Knights of St. Stephen deſerves to be noticed. It was founded by Coſmo I. in 1560, and was meant as a military eſtabliſhment for young men deſtined to defend their country from the incurſions of the Barbareſques. The youthful heroes were once the terror of the Turks, whoſe captured banners ſtill wave in tattered pride within their edifice. Theſe youths are educated and maintained during ſix years by the Tuſcan government.

The botanical garden, the cabinet of natural hiſtory, and obſervatory, though well appointed, are but little attended to by the few ſtudents at Piſa. The correct arrangement of the garden and cabinet does honour to their keeper; and, from the excellent lectures read there, might benefit a larger portion of ſcientific perſons. The obſervatory is well conſtructed, and has been liberally ſupplied with mathematical inſtruments.

The general hoſpital, built in 1257, and dedicated to St. Claire, is on a very noble plan; the ſeveral wards have from 80 to 100 beds. Six phyſicians and two ſurgeons attend in turn: there is beſides a houſe ſurgeon, with an apothecary; and an anatomical theatre is annexed.

The foundling hoſpital here is alſo well conducted.

The four great edifices of Piſa remain to be briefly mentioned.

The CATHEDRAL was built in the eleventh

tenth century, after the deſign of Bruſchetto; it is dedicated to the Aſſumption of the Bleſſed Virgin, whoſe hiſtory is repreſented with the rude Moſaic of later ages in the roof over the great altar.

You here ſee a few ſmall pictures of Andrea del Sarto, particularly one of St. Genevieve, which has great merit. There are others by Roſelli, and ſeveral of the ſecond-rate painters.

The bronze doors, repreſenting much of ſcripture-hiſtory in relievo, with foliage borders of delicate workmanſhip, ſome idly pretend were brought from the temple of Jeruſalem: they were certainly the production of a pupil of John of Bologna.

The walls of the church are built with various antique fragments of ſtone, which retain many mutilated inſcriptions and ſculptures: the moſt remarkable of theſe remains is a ſarcophagus pretty entire, repreſenting the ſtory of Meleager; it is near the door facing the leaning tower; and hard by ſtands a column, ſupporting a moſt elegant marble vaſe, relieved with bacchanalian figures, which is ſaid to have meaſured the pecuniary tribute paid by the republic of Piſa to the Roman ſtate. Within the church, the marble groupe of Adam and Eve merits all the encomiums beſtowed upon it; and the brocatello and breſcia pillars of the pulpit deſerve attention.

The BAPTISTERY is a rotund, covered in with a dome of exquiſite Gothic taſte. It is a diſtinct church, and dedicated to St. John: it was built in 1152, after the deſign of Diotiſalvi. The families of Piſa, then amounting to 14,400, ſubſcribed a florin each to defray the expence.

The great font in the middle is an enormous maſs of beautiful granite. Round the large central depth, calculated for immerſion, are hollowed out other ſmall baptiſmal baſons.

The pulpit, of a pinkiſh tranſparent alabaſter, is moſt curiouſly wrought; and the ſhort columns that ſupport it will delight the naturaliſt; they are uncommon fine ſpecimens of different granites and marbles.

The CAMPO SANTO, begun in 1200, but finiſhed by Giovanni Piſano in 1464, is a large oblong ſquare or parallelogram, of about 150 by 400 feet. A portico ſurrounds it within, whoſe walls are painted with ſcripture ſubjects whimſically treated, by Cimaboue, Giotto, and others of that era. The ſtory of St. Ranieri, the tutelary ſaint of Piſa, may be alſo ſeen on them. One painting is curious, deſcriptive of the qualities of the ſoil, which was ſaid to have been brought from Jeruſalem in 1228, and to have once had the peculiar property of deſtroying in twenty-four hours bodies buried there. It was merely a compoſt of quicklime made on the ſpot.

Various Roman ſarcophagi are placed around this portico. In the relievo of Meleager on one of them, and the woman ſhrouded with linen on another, I do not ſee that merit which Smollet allows. They are ſurely of inferior workmanſhip.

The tomb and buſt of Bartolomeo Cheſi, by Michael Angelo Buonarroti, or, as ſome ſay, by his pupil Lorenzi, is of much worth. But chief to be admired is the elegant monument of Algarotti, the diſciple and friend of our Newton, erected at the expence of the late king of Pruſſia; the inſcription is beautifully ſimple: *Algarottus non omnis*.

The LEANING TOWER is the laſt and moſt remarkable of theſe ſtructures; indeed it ranks among the principal curioſities of Italy. It was built at the cloſe of the twelfth century upon the deſign of William of Almon of Nurenberg.

Buonano Buocci, and Tomaſo of Piſa, compleated it.

Its height, on the average of a variety of calculations, is 203 Engliſh feet; or we might rather ſay its length; for it ſo hangs out of the perpendicular, that a plummet dropt from its ſummit falls 15 Engliſh feet from the baſe.

The building is cylindrical, and has without ſide ſeven ranges of different qualities of pillars, which give it a rich appearance, with a cylindrical turret of a leſſer diameter at the top.

A ſtair-caſe of gradual aſcent winds within it. The late empreſs queen, Maria Tereſa, rode up to the turret on horſeback. The ring of its bells have never injured the ſtructure in any degree.

Much argument and conjecture are beſtowed on the probability of this tower having been built purpoſely leaning, or otherwiſe. Its lower range of pillars ſeems to prove that it was not ſo built by deſign; their baſes at the under ſide of the ſtructure are buried within the ground, and on the upper part are thrown above it: had the builder originally intended this inclination in the edifice, he would have begun his pillars even with the ſoil, to have proved it, and proclaimed his ingenuity. The fact, I believe, is, that the architect meant an upright tower; when he had built to a certain height, the partial ſubſidence of the ſwampy foundation cauſed the ſtructure to incline: it was ſuffered to reſt ſome years, to ſee how far it was ſecure; finding the earth no longer gave way, the building was gradually continued in a more perpendicular direction, till it came to the turret, which is almoſt upright, and whoſe top is nearly parallel to the horizon.

Italy, a country interſected with perpetual rivers, has on its conſequently marſhy ſites many ſuch towers. The Aſinella and Gariſenda at Bologna are inſtances.

Order and humanity regulate the police of Piſa. No crime pays the forfeit of death; but a perpetual diſtinguiſhed bondage among the galley-ſlaves ſupplies that ſentence; more humane, and more uſeful is ſuch punition, as the example is more laſting. The galley-ſlaves of no atrocious criminality are ſometimes hired out for labour to private individuals.

Proviſions of every kind in this town are abundant, and not dear. The traveller ſhould be informed that it has two tolerable inns; *L'Uſſero*, or the Huſſar; and *Le Trè Zitelle*, or the Three Damſels. They are the only inns of the place.

To gratify the invalid, who is in general ſcrupulouſly obſervant of ſeaſons, I have ſubjoined an account of the weather, during the months I was at Piſa in two different winters; whence may be formed ſome judgment of the climate.—I will conclude by remarking, that the laſt winter was uncommonly wet and bad throughout all Europe.

METEOROLOGICAL ACCOUNT

OF THE

WEATHER AT PISA,

IN THE TWO WINTERS

OF

The Years 1787, 1788; and 1792, 1793.

☞ The firſt Column of the Thermometer is its Height at about 8 in the Morning; the ſecond its Height at about 3 in the Afternoon.

DAY.	WEATHER.	WIND.	THERMOMETER.	
October	1787.			
24.	Moiſt ſoft air. Cloudy. Some ſhowers -	S. E.	61	65
25.	Fog on the river in the morning, which ſuddenly cleared away, as the ſun got up. Soft air, and warm ſun - - - - - -	N.W.	60	62
26.	Much rain laſt night. Clouded, heavy day -	S.W^{ly}.	60	62
27.	Morning, fog. A moiſt air throughout the day - - - - - - - - - - -	N.W^{ly}.	62	64
28.	Soft ſtill air. Louring all day - - -	S^{ly}.	61	65
29.	As yeſterday. Rather a drier air - - -	S.	61	65
30.	Soft warm air. Some ſun - - - - -	N.W.	62	64
31.	Cloudy, and rather cold - - - - - - -	E^{ly}.	61	64

November				
1.	Soft rain early. Sun in the middle of the day	S. E^{ly}.	63	68
2.	High wind and hard rain laſt night. Bright ſun in the middle of the day. Wind and rain again in the evening	N. W^{ly}.	63	64
3.	A fine day, with warm ſun. Violent rain, thunder, and lightning in the evening	E^{ly}.	64	66
4.	Some ſun. Moſtly cloudy. Stormy as yeſterday evening	S. E^{ly}.	65	69
5.	Warm and cloudy. Soft, but briſk airs	W^{ly}.	64	65
6.	As yeſterday	W^{ly}.	60	65
7.	Cloudy. Rain conſtant in the afternoon	S. E.	61	59
8.	Rain early in the morning. Fine all day	W^{ly}.	60	65
9.	Fine and warm	S. E.	60	63
10.	As yeſterday	E.	61	68
11.	Soft and warm, with a bright ſun	S. E.	64	69
12.	Rainy all day	S. E.	59	63
13.	Hard ſhowers all day. Some thunder. Strong lightning	S. E.	63	65

DAY.	WEATHER.	WIND.	THERMOMETER.	
Nov. 14.	Cloudy. Conſtant ſhowers. The Arno much riſen	S. E.	53	63
15.	Leſs ſhowery than yeſterday. A ſoft, warm, enervating air	N.	56	63
16.	A cold wind. Showery	S.W.	56	60
17.	Sharp air in the morning. Bright ſun all day	S.W.	52	60
18.	Rain the whole day	N.W.	53	56
19.	Raw cold air. Frequent ſhowers. The Arno much ſwelled	S. E.	52	56
20.	Clear cold air. Bright ſun. Rain at night. The river fallen 4 feet	S. E.	49	56
21.	Clouded. Sharp air	N. E.	48	53
22.	Bright ſun. Sharp air	S. E.	46	53
23.	— — — — —	—	40	—
*	* * * * * * *	*	*	*
27.	Sharp air, and keen wind	S. E.	40	46
28.	More cloudy, but leſs windy than yeſterday	S. E.	40	46

29.	Sharp clear air. Ice in the country - - -	S. E.	38	44
30.	Very keen air. Bright ſun - - - - - -	S. E.	35	45
December				
1.	As yeſterday - - - - - - - - - - -	S. E.	36	50
2.	As yeſterday - - - - - - - - - - -	S. E.	36	52
3.	Chilling air. Rain all day - - - - - -	N. W^{ly}.	44	50
4.	Soft, warm air. Thick, conſtant ſmall rain -	S. E.	54	56
5.	Wet, gloomy day. River much ſwelled - -	S^{ly}.	54	56
6.	Cloudy moiſt air, but no rain. Faint ſun at intervals - - - - - - - - - - -	S^{ly}.	56	60
7.	Gloomy, chill air, with rain - - - - - -	S. W.	56	58
8.	Moiſt air, but ſunny - - - - - - - -	S. E.	56	60
9.	Cloudy, and moiſt. Faint ſun - - - - -	S. W.	54	61
10.	Sunny day; but ſoft, and moiſt air - - -	N. W.	52	60
11.	Soft, warm, and clouded; though fine - -	S. W.	52	58
12.	Clouded, but pleaſant - - - - - - -	S. W.	54	60
13.	Cloudy, raw, and cold - - - - - - -	E.	52	56
14.	Cloudy. Rain in the evening - - - - -	W^{ly}.	53	57
15.	Showery. Sunny, and warm in the middle of the day - - - - - - - - - -	S. E.	52	60

DAY.	WEATHER.	WIND.	THERMOMETER.	
Dec. 16.	Conſtant rain - - - - - - - - -	S.W.	53	59
17.	Fine, but rather cold air - - - - -	S.W.	53	58
18.	Damp air. Cloudy - - - - - - -	S. E.	52	53
19.	Soft air. Sunny - - - - - - - -	N.W.	55	60
20.	Rainy all day - - - - - - - - -	S.W.	57	58
21.	Cloudy. Warm - - - - - - - -	N.W.	52	56
22.	Fine day. Rainy night - - - - -	S. E.	44	56
23.	Continued rain - - - - - - - -	W.	56	57
24.	Moiſt air. Showery - - - - - -	N^{ly}.	52	60
25.	Dry air. Very fine - - - - - - -	N^{ly}.	52	58
26.	Rainy. Hard rain at night - - - - -	W^{ly}.	54	55
27.	Soft, and fair. Somewhat cloudy - - -	E^{ly}.	53	62
28.	Cloudy, ſoft, and pleaſant - - - - -	E.	54	62
29.	Cloudy. Rather cold. Some rain - - -	S^{ly}.	53	58
30.	Cloudy. Mizzling rain - - - - - -	S. E.	52	56
31.	Fine, and pleaſant. Rather cold - - -	E^{ly}.	50	58

January	1788.			
1.	Cloudy, but pleaſant	N. E.	48	55
2.	Rain, with thunder and lightning at night	N. E.	52	56
3.	Hard rain all day	S. E^{ly}.	52	56
4.	As yeſterday	N. W.	51	57
5.	Some rain, but in general fine. The Arno roſe nearly to the top of the piers of the bridge	S. W.	51	59
6.	Cloudy, and much rain	S^{ly}.	50	57
7.	Continued hard rain	E^{ly}.	49	52
8.	Cloudy. Hard rain in the afternoon	E^{ly}.	51	55
9.	As yeſterday	E^{ly}.	51	55
10.	Pleaſant air. Warm ſun	E^{ly}.	50	58
11.	Froſt early this morning. Sunny, and fine	E^{ly}.	44	55
12.	Bright ſun, and pleaſant	E^{ly}.	43	57
13.	Clear cold air. Sunny, and fine	E^{ly}.	40	58
14.	Cold, and cloudy. Some rain	W^{ly}.	52	54
15.	Keen wind. Bright ſun	N. W^{ly}.	43	49

DAY.	WEATHER.	WIND.	THERMO-METER.	
Jan. 16.	Clear, cold day	S. E^{ly}.	36	48
17.	Froſty. Cold. Cloudy	N. E^{ly}.	43	48
18.	Cold, and cloudy	W^{ly}.	46	52
19.	Cold, and cloudy. High wind roſe at noon	S. W.	48	56
20.	Mizzling rain all day	S. E^{ly}.	46	46
21.	Clear, ſharp air. Cold day	E^{ly}.	40	48
22.	Cold, froſty, with bright ſun	E^{ly}.	34	46
23.	As yeſterday	E^{ly}.	33	51
24.	As yeſterday	E^{ly}.	35	48
25.	Cold, and moſtly cloudy	E.	38	51
26.	Cold, and cloudy	E.	48	53
27.	Cloudy. Small rain	N. E.	48	54
28.	Cloudy	E^{ly}.	47	53
29.	Cloudy, but leſs cold than ſome days paſt	E^{ly}.	46	54
30.	As yeſterday	E^{ly}.	40	—
*	* * * * * *	*	*	*

February				
1.	Cloudy. Very cold	E^{ly}.	37	45
2.	Rainy all day	N. E.	46	48
3.	As yeſterday. The Arno much ſwelled	N. W.	48	50
5.	Some rain	N. W^{ly}	47	51
6.	Cloudy, with ſome rain	N. E.	52	58
7.	Cloudy. Rainy	N. E^{ly}	52	58
8.	Cloudy, and cold, with ſome rain	—	—	—
9.	Much rain	—	—	—
10.	Rainy	—	—	—
	1792.			
December				
1.	Fine warm ſun. Sharp air in the ſhade	N. E^{ly}.	44	54
2.	As yeſterday	N. E^{ly}.	41	50
3.	As yeſterday, but rather colder	N. E^{ly}.	40	52
4.	Leſs cold. More grey, and clouded	N. E^{ly}.	46	51
5.	Very warm, and ſharp air	N. E^{ly}.	39	52
6.	Hot ſun. Warm air. Cold evening	N. E^{ly}.	47	58

DAY.		WEATHER.	WIND.	THERMO-METER.	
Dec.	7.	Soft air. Very warm ſun	N.W^{ly}.	52	60
	8.	Warm mild air. Sunny	S. E.	48	58
	9.	As yeſterday. Cold in the ſhade	E.	42	46
	10.	Cold. Clouded. Sunleſs	S. E.	36	44
	11.	Soft, and warm. Faint ſun	S. E.	46	52
	12.	Hot ſun. High, and hot wind	N. E.	46	54
	13.	Sharp air. Warm ſun	E^{ly}.	40	47
	14.	Very cold; but fine	N. E.	38	52
	15.	Soft warm air. Little ſun. Some rain	S. E^{ly}.	39	47
	16.	Faint ſun. Soft and pleaſant. High wind	S. W^{ly}.	46	51
	17.	Briſk air. Warm ſun	N. E.	42	49
	18.	Rather clouded, and cold	S. E.	34	44
	19.	Cloudy. Cold. Damp. Mizzling rain	S. E^{ly}.	43	47
	20.	Moiſt air. Cloudy. Some faint ſun	S. E^{ly}.	39	50
	21.	Cloudy. Stormy. Faint ſun. Very high wind	S. W.	47	50
	22.	Warm ſun. Fine	N. W.	49	59
	23.	Cold. Sleet fell. (Snow at Florence)	E^{ly}.	33	40

24.	Cold, and cloudy	N^{ly}.	33	44
25.	Cold. Rainy	N^{ly}.	40	46
26.	Fine, but ſhowery	S. W^{ly}.	45	54
27.	Hazel rain in the morning; then fine	N. E^{ly}.	37	50
28.	Warm. Sunny. Pleaſant	N. W.	33	44
29.	Soft, pleaſant air. Warm ſun	N. W^{ly}.	36	48
30.	Warm. Sunny. Pleaſant	S. W.	38	50
31.	Clear air. Bright ſun. Pleaſant	S. E^{ly}.	37	50
	1793.			
January				
1.	Briſk, pleaſant air. Warm ſun	S. E.	38	40
2.	Clear, ſharp air, with bright ſun	E^{ly}.	32	46
3.	Mizzling rain all day. Hard rain at night	N. E^{ly}.	34	51
4.	Very ſharp air. Sunny. (Snow on the hills)	S. W.	36	48
5.	A ſharp air, with leſs ſun than yeſterday	S. E.	32	44
6.	Rain more or leſs the whole day	S. W.	36	41
7.	Cold, briſk air. Sunny, and pleaſant	N^{ly}.	42	50
8.	Very ſharp air, with bright ſun. Ice	E.	38	40

DAY.	WEATHER.	WIND.	THERMO-METER.	
Jan. 9.	As yeſterday; but colder, and harder froſt -	N. E.	34	38
10.	Sharp air. Bright ſun. Very hard froſt -	E^{ly}.	34	36
11.	Piercing cold. Clouded. Large maſſes of ice rolling down the Arno. Sleet, ſnow, and rain in the evening - - -	E.	26	32
12.	Rain all day. Very hard rain at night - -	S^{ly}.	40	42
13.	Chill, damp air. Faint ſun. Some rain -	S. W.	44	46
14.	Rain all day - - - -	S^{ly}.	41	52
15.	Alternate hard rain, and ſun-ſhine - -	S. W.	39	48
16.	Clouded, and rainy - - -	S. W.	39	48
17.	Faint ſun. Rain at intervals - -	S^{ly}.	40	50
18.	Moiſt air. Some ſun - - -	S. E.	41	52
19.	Bright ſun. Sharp air - - -	E^{ly}.	42	50
20.	Bright ſun. Very ſharp air - - -	E.	39	43
21.	Very warm ſun. Sharp air - - -	S. E^{ly}.	35	48

Should this little work fall into the hands of thoſe who remark the winds in Italy, ſubjoining their familiar Italian appellations may to ſuch prove acceptable.

N. - - - -	Tramontana.
N. E. - - - -	Grecale.
E. - - - -	Levante.
S. E. - - - -	Scirocco.
S. - - - -	Mezzo-giorno.
S. W. - - - -	Libeccio.
W. - - - -	Ponente.
N. W. - - - -	Maëſtro.

PAPERS

ON THE

YVERDUN WATER.

ANALYTICAL PAPERS,

&c. &c.

INTRODUCTORY OBSERVATIONS.

THE Waters treated of in the few following pages, have been but little attended to by writers on Mineral Springs. Having witneſſed two or three inſtances of their good effects, I wiſh to introduce them into better notice. It is for this purpoſe I offer to the public a tranſlation of ſome French papers relative to them, preſerved in the archives of Yverdun, of which I procured a peruſal by means of the chief magiſtrate of the town. I by no means offer it as a work of great chemical merit. The ſcience of chemiſtry has of late years gained improvements, and received a colour which it had not when the following little treatiſes were prepared. The reader muſt, therefore, make allowances for thoſe obſolete terms of art which I have retained, as well as for many inaccuracies and opinions which are exploded at this more enlightened period: but I choſe to give them in their native ſtate, under an Engliſh dreſs, leaving the chemical world to judge for themſelves, as chemiſts and phyſicians alone this work concerns. It may be aſked, why curioſity did not induce me to make a ſet of experiments on theſe waters, inſtead of retailing thoſe of others? I did not viſit Yverdun with an idea of inveſtigating its waters: the neceſſary materials for ſuch inveſtigation were not at hand; and my ſhort ſtay at the place did not allow me to procure all ſuch as I wanted from a diſtant town. I will, however, briefly ſet down the reſult of a few experiments I made with the beſt materials I could get from an apothecary of the place. Having a thermometer luckily with me, I can ſpeak more decidedly of the temperature of theſe waters, than of their contents, from my own knowledge.

EXPERIMENTS.

DROPPING into a half pint glaſs* of the water, 60 drops of vitriolic acid, (which was not of the pureſt, and very dark) a ſmart crepitation enſued for the moment, and a ſlight effervescence. The mixture had little of an acid taſte, but rather that of a neutral ſalt diſſolved in it, and remained unchanged in colour.

Nitrous acid, dropped into the water, produced no crepitation, and leſs effervescence than the vitriolic acid; 60 drops gave but little acid taſte to the water.

---

* The ſame quantity of water was uſed in each experiment.

The ſame quantity of both vitriolic acid and nitrous acid, dropped into common water, gave a very acid taſte. A proof of the preſence of alkali in the Yverdun water.

Syrup of violets turned it of a faint dirty green; a proof of its alkaline principle.

A few drops of a ſolution of lunar cauſtic turned it blackiſh, with a little tinge of yellow; a proof of ſulphur. Some oil of Tartar per deliquium being added, denſe white flocculi appeared, which did not float readily on the water. A ſolution of volatile alkali produced no flocculi, but a ſmall black precipitate ſoon formed.

On pouring in a very few drops of Goulard's extract of Saturn, it immediately turned of a deep yellow, and in half a minute grew black at top; another proof of ſulphur.

Mercury, rubbed down with manna, and

diſſolved in this water, (Plenck's mixture) on ſtanding, gave a precipitate that was white, or of a very faint grey. On pouring ſome vitriolic acid to this, ſo as to ſaturate the alkali, the precipitate became dark; the ſulphur of the water and the mercury forming a kind of æthiops.

Tinctura martis produced no change, but that of deepening its colour, proportionably as it was added.

A ſolution of galls, the ſame. A proof the water has no chalybeate principle.

A ſolution of blue vitriol turned it green, but no precipitation took place.

Oil of Tartar per deliquium produced no change.

Neither did a ſolution of volatile alkali.

Not having time, or opportunity, I made

no experiments on the ſaline or earthy qualities of the water, by evaporation and filtration.

TEMPERATURE OF THE WATERS.

I Meaſured the heat of the waters for five ſucceſſive days, immerſing a thermometer, graduated by Fahrenheit's ſcale, at the fountain head that is in the baſon, which includes both ſprings, and found it invariably at 78. One morning, that was much colder than ordinary, after ſeveral immerſions, the mercury would riſe no higher than 77.

I will ſubjoin the height of the thermometer during the few days I remained at Yverdun in the month of June. I made my obſervations between 6 and 7 in the morning, when I roſe, as marked in the firſt column, and again at about 1 o'clock, as marked in the ſecond column.

62——68.
62——64.
60——66.
58——66.
62——85.
60——70.
58——74.
64——79.

Our weather was in general warm, ſoft, and pleaſant. We had one or two rainy days, and the wind varied from S. E. to S. W.

SITUATION OF THE BATHS.

THE Baths are about a quarter of a mile diſtant from Yverdun, an eaſy fifteen minutes walk from the town's end, on the great road to Meudon, which is dry and pleaſant. The baſon comprehending the two ſources, is about 15 paces from the baths; it is 28 feet deep: the one of theſe is a warm ſpring, the other a cold one, and they ſo blend with each other, that it is impoſſible to ſeparate them. The baths conſiſt of nine ſmall bathing rooms, each containing two baignoirs, or bathing tubs. The natural heat of the water being but 78, it is neceſſary to have a portion of the water heated and added to the bath, before it be uſed, ſo as to bring it at leaſt to blood heat, below which degree it would be chill and unpleaſant. The bath hotel is newly fitted up, and is comfortable and convenient; the rooms are ſpacious, it has upwards of twenty bed-chambers, and a large dining-room. There is a table d'hote at 1 livre 10 ſous per meal, an apartment at 2 livres a day, and the price of a bath is 10 ſous. To ſome of my readers this economical information may be an object. The eſtate of the baths belongs to the town of Yverdun, and is now rented at £. 50 ſterling per annum: it is never leaſed, therefore the rent is ſubject to annual variation.

TOWN OF YVERDUN.

YVERDUN, in the Pays de Vaud, is delightfully ſituated on a little plain, at the S. W. extremity of the Lake of Neufchatel, cloſe to the mouth of the river Thiele, which, with the lake, inſulates the town. It is not very populous, but ſupplies all the conveniencies of life at a reaſonable rate: the lake produces excellent fiſh, particularly trout. The country about it is not bold, but rather of a quiet beauty, though the Jura mountains bound your weſtern view. The rides are delightful, particularly by the lake ſide, and towards Meudon. There is a lovely walk of trees between the lake and the town. To enjoy Yverdun, one ſhould love retirement; it affords but few of what the French call *reſources*. Many of our youths withdraw here during the vacation of the Engliſh univerſities, for the ſake of employing that interval in acquiring a knowledge of the

French tongue. A pupil and his tutor cannot be in a place more tranquil, pleaſant, and advantageous for ſtudy.

Yverdun boaſts no great commerce, the manufacture of cloths and bleaching are ſtill in ſome reputation, from the excellent fuller's-earth which is found near the town. Had the canal between its lake and that of Geneva been completed, it might have rendered it more commercial; ſtill, its finiſhed extent of only four leagues is of ſome utility to the neighbouring habitations; it goes as far as a place called Entroches, which, by the way, was once the extremity of the lake; for its waters have been imperceptibly falling away from thence every year. Printing was once eſtabliſhed here, and many excellent works came from the Yverdun preſſes, particularly the French Encyclopédie.

Antiquities are ſometimes found in the neighbourhood: a few medals of the lower empire, and a mile-ſtone have been dug up; ſome curious dried ſkeletons were alſo diſcovered about thirty years ſince. The hiſtory and police of the place are accurately deſcribed in the Dictionnaire de la Suiſſe, an excellent work, which every traveller into theſe parts provides himſelf with.

ANALYSIS

OF THE

MINERAL BATHS of YVERDUN,

BY MONS. STRUVE,

PHYSICIAN and CHEMIST, at LAUSANNE,

MADE IN THE YEAR 1778.

Given at the Council, 12, 24, and 27 March 1779.

ANALYSIS, &c.

THESE Waters have been very long known, and the great number of happy cures they have effected, confirm their ſalubrity. We might naturally preſume that their contents had been accurately inveſtigated. Trifling, however, is the reſult of any experiments hitherto entered upon, which is ſomewhat wonderful. This has led me to a more particular examination of them, and here I mean briefly to enter into every diſcovery I have made relative to them.

The honoured Lords of the Council ordered their phyſicians, in 1729, jointly with Monſ. Vild, to analyze the waters of Yverdun. After this order, Meſſrs. De Coppet and De Condey analyzed them, and obtained from 48 ounces of water 12 grains of a ſaline reſiduum. In the original copy of this analyſis, I find nothing reſpecting the nature of the reſiduum. We may remark, how very inſufficient 48 ounces of water muſt be for ſuch an examination. What judgment can we form from the reſult of it? There is alſo in the archives of the town of Yverdun, from whence I have taken the preceding analyſis, a letter, dated 31 March 1736, of Monſ. Invernoi's, in which he mentions to have found a ſalt ſomething like vitriol (approchant du vitriol)

triol) a very vague expreſſion, which ſays nothing, and which the author perhaps underſtood as little as his readers.

I find, in the Swiſs Mercury of June 1736, another analyſis, by which there has been obtained from theſe waters, a reſiduum of the nature of Armenian bole, combined with alkaline ſalt. This analyſis has ſomewhat more of preciſion than the foregoing, without being quite ſatisfactory. I at length find, in the Yverdun Encyclopedia, under the article Yverdun, that theſe waters muſt contain a liver of ſulphur, an abſorbent earth, a neutral ſalt of the nature of vitriolated tartar, a little marine ſalt, in ſhort, a ſulphureous volatile principle; but I am ignorant of the experiments from which the author of this article has drawn his concluſions; and we ſcarce can have reaſon to truſt to ſuch an aſſertion: for vitriolated tartar, is one of thoſe ſalts which nature does not form in the bowels of the earth.

It is evident from what I have ſaid, how little theſe waters are underſtood. I truſt the reſult of my obſervations will better determine their nature.

PRELIMINARY EXAMINATION.

THIS Water is of itſelf exceedingly clear and limpid. Poured into a glaſs of water, it produces many bubbles, which ſoon diſappear; this proves its lightneſs: it is indeed very light, for its ſpecific gravity, or relative weight to that of diſtilled water, is as 10,015 to 10,000. A Lauſanne *pot* of this water weighs 4 pounds, 14 ounces, 4 drachms, and 30 grains. It is excellent for waſhing, and takes out greaſy ſpots. It diſſolves ſoap readily. It boils vegetables well; mixt with an equal quantity of milk, it prevents their getting ſour for a much longer time than any other water would do, and the milk ſo mixt becomes ſour leſs ſoon than when unmixt, which proves it to be a very light water, probably alkaline, that contains very little of an earthy ſalt. Taken from the ſpring it is lukewarm; it raiſes Reaumur's thermometer (conſtructed and rectified upon de Lue's principles) to 19 degrees. It has a ſtrong ſmell of liver of ſulphur, or of rotten eggs. It has the taſte of liver of ſulphur, with ſomewhat alkaline.

Expoſed to the air it preſerves its ſmell and taſte for a conſiderable time; at length a white pellicle appears.

It may be preſerved in bottles, well corked, without loſing any of its virtues. I kept ſome above a month, that is, from the 11th of June to the 20th of July, in well ſtopped veſſels, which loſt nothing of its ſmell or taſte, and which with teſts produced the ſame effects as at the ſpring-head.

Hence it is thus far evident, that theſe waters have certain determined principles, and that we ought rather to expect the preſence of pure ſulphur, than of any volatile ſulphureous matter.

With teſts it produces the following changes: oil of tartar per deliquium occaſions no precipitation in the water, nor does it become any ways turbid, but it acquires however a ſlight olive tint; which proves that it contains only a very ſmall portion of an earthy ſalt: ſtill we muſt not conclude from theſe experiments, that the water contains no real earth; for when earths are mixed with water, without the intervention of an acid, oil of tartar will not ſeparate them from it. Syrup of violets mixed with this water ſoon becomes green, which proves the preſence of an alkali. As lime water, lime oil, * vitriol of Mars, vitriol of copper,

---

* Being unacquainted with the preparation he calls *lime oil, (huile de chaux)* I wrote to Dr. Struve to enquire what it was; he returned the following for anſwer: "*Lime oil*, is that liquor which is formed from the reſiduum of the diſtillation of ſpirits of ſal armoniac with quick lime, by expoſing it to the moiſture of the air,

copper, cauſe a ſlight precipitation; as cream of tartar, in ſmall quantity, diſſolves in it; as cold occaſions ſmall bubbles on the ſide of the glaſs that contains it; and as the marine and nitrous acids cauſe bubbles to ariſe therein, we may therefore very reaſonably admit the exiſtence of an alkaline ſalt.

If we pour into this water an acid, whether it be vitriolic or nitrous, it yields a ſulphureous ſmell, which proves the preſence of ſulphur, diſſolved by means of an alkaline ſalt; for were it ſimply a volatile ſulphureous principle, no ſmell would have been ſent forth: moreover, acids do not render the water turbid. A ſolution of ſilver produces a thin precipitate. A ſolution of lead in vinegar cauſes a yellowiſh tinge, and the ſulphureous ſmell goes off, which confirms what we have juſt advanced: but the

---

air, or by pouring upon it a little warm water; it is likewiſe called *liquid fixt ſal armoniac.* It may alſo be produced, by diſſolving quick lime or chalk in marine acid, till it is ſaturated."

quantity of ſulphur is no ways conſiderable; for acids do not ſenſibly diſturb the water, the precipitate formed by a ſolution of ſilver is not black, the ſolution of lead does not darken it, * and a ſolution of mercury, inſtead of giving a black precipitate, with this water gives a white one †.

It is ſeldom that a ſulphureous water undergoes ſo few changes with teſts: I have however had occaſion to obſerve this in waters infinitely more loaded with ſulphur, as in the waters of Bevieux, and the ſprings near Gayone, which their Excellencies of Berne had commiſſioned me to analyſe.

If a few drops of nitrous acid be mixed with this water, ſufficient to ſaturate the alkali and the earth it contains, and a ſolution of ſilver be afterwards poured upon it; a white, clouded precipitate is formed, which

---

* This is true, ſee my experiments; I repeated it ſeveral times.

† See my experiments.

which proves the preſence of common ſalt;[*] and if, with the water ſo prepared, we mix a ſolution of mercury in nitrous acid, a white curdled precipitate is formed, which becomes yellow by pouring hot water upon it; a proof that the water contains a vitriolic ſalt. Neither an infuſion of galls nor the lye [†] of blood produce any change; the water therefore contains no iron: we we may then, to a certainty, conclude from theſe experiments, that the waters of Yverdun are light waters, containing ſulphur united with a fixed alkali, common ſalt joined with vitriolic ſalt, and an earth; for all alkaline waters contain earth.

Knowing the contents of theſe waters,

---

[*] I tried this experiment twice, but the water only grew a little browniſh, and was rather turbid; the exiſtence then of common ſalt is not ſo certain.

[†] *Lye of blood, (leſſive de ſang)* is the phlogiſticated alkali of chemical authors, or the lixivium of Pruſſian blue. It may be obtained, by diſſolving Pruſſian blue in a ſolution of either mild or coſtic alkali.

Dr. STRUVE.

let us endeavour to ſeparate them, and examine their nature and quantity.

CHEMICAL ANALYSIS.

The better to underſtand the nature of the Yverdun waters, I made one analyſis of them at their ſource, and another at Lauſanne.

ANALYSIS MADE AT THEIR SOURCE.

I took 93 ounces of the water, I evaporated it: at the beginning of the evaporation, I perceived a number of brown flocculi, which dropped to the bottom of the liquor, and I obtained after the evaporation a reſiduum of grey ſalt, which, being thoroughly dried, was of a cinnamon colour: this reſiduum had the taſte of a mixture of common ſalt with fixt alkali; it diſengages the volatile ſalt of ſal armoniac, and attracts the moiſture of the air by reaſon of its alkali.

Thrown upon hot coals it decrepitates, owing to the common ſalt it contains; but it does not flame, conſequently contains no ſulphur.

We ſhall ſee the reaſon of this further on. Theſe 93 ounces of water gave 20 grains of reſiduum, which, being diſſolved in water, left 8 grains of a grey calcarious earth, that had no taſte, but adhered a little to the tongue. The ſolution gave 6 grains of common ſalt, 3 grains of ſelenite, 2½ grains of fixt mineral alkali.

We have ſeen by the preliminary examination, that this water contains ſulphur. The analyſis by fire has however given none. Hence we find that the ſulphur has been decompoſed by evaporation; a very uſual phenomenon, as we may ſee by the work of Monet: I then was to find out ſome means of ſeparating the ſulphur, before its decompoſition.

I obtained this difficult point in the following manner.

I again took 93 ounces of the water; mixing a ſolution of mercury with it, I obtained a conſiderable precipitate, which, thrown upon hot coals, burned with a blue flame, and when ſublimed yielded about 6 grains of cinnabar; there alſo ſublimed at the ſame time, ſome corroſive ſublimate, and a little mercury: products which we ought not to be aſtoniſhed at finding, ſince the contents of the water, united with mercury, muſt form them from chemical laws; cinnabar being only a compound of ſulphur and mercury. I had then in this cinnabar, the ſulphur of the water united with mercury. Now as cinnabar contains 1-6th part of ſulphur, we may compute the ſulphur contained in theſe 93 ounces of water at about 1 grain. I have ſaid that the earth of theſe waters was calcareous. I convinced myſelf of it thus: having taken a portion of the earth, and thrown it upon coals, it yielded no ſmell, and was unchanged; and having taken another portion, upon which I poured ſome ſpirit of vitriol, till all effervеſcence ceaſed, the whole was diſſolved; it had a flat and ſomewhat ſharpiſh taſte; in ſhort it ſeemed to be ſelenite.

ANALYSIS MADE AT LAUSANNE.

Still better to underſtand the nature of theſe waters, and to be certain that they loſt none of their virtues by carriage, as well as to be ſtill further convinced of their contents, I examined them at Lauſanne in larger quantity.

On the 13th June, I took 15 flaſks of them, which contained 117 pounds 13½ ounces, the weight of 16 or 24 POTS * of Lauſanne, and I obtained 238½ grains of a ſaline reſiduum, which was compoſed of 95¼ grains of calcareous earth, 33¼ grains of ſelenite, 80 grains of common ſalt, 29½ grains of fixt mineral alkali.

According to this account, in 48 ounces

---

* The Lauſanne *pot* is about 40 Engliſh ounces.

of water, there muſt be 12½ grains of ſaline reſiduum, or 4½ grains in a pound of 16 ounces; which is much more than we have obtained, in analyſing the water in ſmall quantity at the ſpring; which need not ſurpriſe us, becauſe, how little ſoever might adhere to the ſides of the veſſel, it ſtill becomes a conſiderable object in experiments in ſmall, which is almoſt loſt in experiments largely made. The quantity I obtained is nearly the ſame with Mr. Cordey's, who, in the ſame manner, from 48 ounces got 12 grains of reſiduum. As the ſulphur decompoſed itſelf by evaporation, I had recourſe, as before, to a ſolution of mercury, to be aſſured whether the ſulphur ſtill exiſted in it after carriage: and I obtained, by this means, from 12 pounds of water, 12 grains of cinnabar; ſo that this quantity of water contained 2 grains of ſulphur. There is in every *pot* of the water, beſides the contents ſpecified, about 1 grain of ſulphur, which is kept in ſolution by means of a mineral alkaline ſalt. It has been already ſaid, that there were ſeparated from the reſiduum, beſides the earth, ſelenite, common ſalt, and mineral alkali; without particularizing the proceſſes, which I ſhall but ſlightly mention, as they muſt be familiar to all who have analyzed waters, and ſuch readers only are concerned therein.

I ſeparated then the earth from the reſiduum, by pouring water upon it, and filtering the whole; the earth remained upon the filter, the diſſolved ſalts paſſed through: I took the filtered liquor, and I ſaturated it with acid of vinegar; the ſaturation cauſed a conſiderable efferveſcence. By means of ſaturating the alkali contained in this ſolution, it was eaſy, by cryſtallization, to ſeparate the ſelenite and common ſalt, whoſe individual weight, taken from that of the whole, gave me the quantity of fixt alkali which the vinegar had changed into neutral ſalt. The analyſis of this water, therefore, ſhews us, that it is a ſulphureous alkaline water, that theſe principles are fixt, and that it will bear carriage, an advantage belonging to but few ſulphureous waters. There is one point, which it would be very intereſting to decide upon; it is, whether theſe waters have always had the ſame qualities; whether they have ever loſt them; to find out the reaſon of it; and what means might prevent ſuch loſs of their qualities.

If tradition may be depended upon, the waters were heretofore ſuperior in their qualities; and their inferiority may be dated from the time when the new baths were conſtructed. The ſpring lying too low to run down into the new baths, they were obliged to make the water riſe higher: for this purpoſe they ſurrounded the ſpring with a baſon, the water filling this baſon, it roſe to a ſufficient height to run into the new baths. If we conſider that this baſon is 11 feet broad and 11 long, that the column of water it contains is 27 feet high, and that this baſon is too ſuperficially covered, not to be expoſed to the influence of the air; may we not reaſonably conjecture, that it is ſubject to changes for the worſe? For, in the firſt place, the water preſenting to the air a ſurface of 121 ſquare feet, muſt loſe, from the action of the air on a ſurface of ſuch extent; ſecondly, the column of water being ſo vaſt, for it is equivalent to nearly 33,000 cubic feet, I can ſcarce think it poſſible that ſo enormous a maſs can be entirely renewed, and I am inclined to believe that it muſt ſtagnate to a certain degree. Thoſe who know with what facility liver of ſulphur is decompoſed, as Monet and Lucas have clearly proved, will admit the inconveniencies of this large column; and who knows, if within the ſpace of 121 ſquare feet from the bottom, there be not ſome current of freſh water, which injures and diminiſhes the warmth of theſe waters, for it is credibly related, that they have loſt much of their qualities and heat; I have indeed heard it aſſerted, that there is a ſpring of freſh water preciſely at the bottom of this covered baſon. It were then to be wiſhed, that this fact was aſcertained, if without riſk it could be done, and that the freſh water ſpring were ſeparated, and an attempt made to include the ſulphureous one in a baſon, or ſome confined paſſage, that the air might be as much as poſſible excluded from it.

With reſpect to the medicinal qualities of the waters, we may juſtly expect much from them. The alkali they contain renders them excellent reſolvents, and adapts them to thoſe chronic diſorders, which originate from obſtructions in young perſons fluor albus, gout, rheumatiſm, and various hypochondriac affections. Their ſulphur renders them uſeful in diſorders of the ſkin, ulcers, arthritic diſeaſes, &c. Either from their ſulphur, or from their common ſalt, acting, according to Boerhaave's doctrine, as one of the incidentia, theſe waters may correct the different diſorders of the ſtomach. The calcareous earth they poſſeſs, as an antiacid, may be uſeful in a variety of caſes; and if we add to theſe effects, alſo thoſe of a light, lukewarm water, we ſhall judge what advantage we may promiſe ourſelves from the Yverdun ſpring, whether internally or externally employed. Sulphureous waters have been found of ſuch utility, that many phyſicians have gone ſo far as to imitate them. The Count of Sorbait employed, with great ſucceſs, ſulphur diſſolved with lime, in the form of a bath, for arthritic pains and diſorders of the joints. Theſe artificial baths have been exceedingly efficacious in a great number of paralytic, arthritic, nephritic, and calculous complaints, as well as in hyſterical women.

The king of Poland's phyſician (Chambou) recommended the uſe of them in ulcers, itch, rheumatiſm, and ſcrophulous tumors. I find, in the Swiſs Mercury of June 1736, and of May 1742, alſo in the Encyclopedia, under the article Yverdun, that the waters of Yverdun have produced very good effects. My reſpectable friend Monſ. Venel has made ſeveral curious obſervations, which prove their efficacy. His knowledge and his ſtation enable him to make many, which it were to be wiſhed he would render public.

I ſhall conclude, by hoping that what I have the honour to preſent to the honoured Lords, will anſwer their views, and have the happineſs to deſerve their approbation.

SIR,

I Have been favoured with both your obliging letters, and have this moment read your laſt, which is but now arrived, otherwiſe I ſhould have returned an earlier anſwer. I am truly ſenſible of the very gracious reception with which the noble Council have honoured my analyſis, and alſo with the manner in which they have teſtified their approbation. The illuſtrious Society of Phyſics at Berne, to whom I preſented it, crowned it with ſucceſs, and adjudged me the prize for the beſt treatiſe on any mineral ſpring. I ſhall be truly happy, if my labours can any way contribute to render theſe waters known in the advantageous manner they deſerve. I have the honour to be, with the moſt perfect reſpect,

SIR,

Your very humble and
obedient ſervant,
H. STRUVE.

Lauſanne, April 8, 1779.

To
The Governor PERCERET,
Member of the Noble Council,
Yverdun.

A LETTER

From Monſ. D'YVERNOIS, relative to the Waters of the Baths, 31 March 1736.

SIR,

I Had the honour of your letter, and received your bottle of the waters: I have carefully examined, and made various experiments upon them. It is very evident that they are exceedingly ſulphureous: their analyſis alſo convinces me, that they contain a ſalt of a vitriolic nature. I have now in my poſſeſſion ſome of this ſalt; and if it is your wiſh, my good Sir, I will ſend you ſome of it. A pot of our meaſure has yielded me above ſix grains, which is about half a thimble full. I have no doubt but that the paſſages through which theſe waters flow, or drain off, are loaded and incruſted with ſuch ſalt. I requeſt that you would pay attention to this circumſtance, and if the gentlemen of your place have examined the waters, oblige me, by informing me what was the reſult of their inveſtigation.

I likewiſe wiſh to know, 1. What is nearly their degree of heat at the ſpring-head? 2. When they firſt began to employ theſe waters medicinally? 3. Whether they are drunk in common? 4. Whether, when internally uſed, they ſoon paſs off, or bind the body? 5. What remarkable, and well-atteſted cures they have effected? 6. How many perſons the place is capable of accommodating, and how many lodging-rooms there are for maſters and ſervants? 7. How many days uſe of the waters commonly effects a cure, and how much you pay for the baths, for your diet, and for the rooms? Judging from the analyſis that has been made of them, theſe waters muſt be principally ſerviceable for the itch, tetters, external ulcers, more eſpecially thoſe of the legs, which are very common in this country; for injured, relaxed, or paralytic limbs; for the rheumatiſm; for women of a cold conſtitution, and barren, or ſuch as are ſubject to the whites, &c. The internal uſe of theſe waters appears to me rather doubtful; and I ſhould adviſe their being drunk with extreme precaution, particularly by perſons any way inclined to phthiſis, which almoſt all our inhabitants are diſpoſed to. Conſider, Sir, whether I may publicly ſpeak of the waters under theſe ideas of them; and let me intreat, that you would not long delay to inform me, whether experience confirms, or refutes my opinions: and here this matter ſhall reſt, till I have received your anſwer. The bottle ſhall be returned to any perſon you ſhall mention.

I am, conſtantly and ſincerely,

SIR,

Your very humble ſervant,

D'IVERNOIS, D.M.

Neufchatel, 31 May 1736.

To

Mr. HUGUENIN,
At the Baths,
Yverdun

ANALYSIS
OF THE
WATERS OF THE BATHS,

Made 6th of July, 1729, by our Doctors in Phyſic.

THE Honoured Lords of the Council having ordered their phyſicians to analyze the Waters of their Baths, with Mr. Vild; the apothecaries of the town, having by them been invited to the analyſis, they proceeded upon it in the following manner;

Being arrived at the ſprings, and having exactly weighed the waters of each, they proceeded to make the following experiments.

Experiments made upon the Waters of the great Springs of the Baths.

BY PRECIPITATION.

OIL of tartar per deliquium immediately produced a very brown yellow, and gave it a ſteely taſte, throwing down at the bottom of the glaſs a browniſh matter, which, being filtered, appeared like ſomething bituminous, and was inſipid to the taſte.

Spirits of vitriol, of nitre, of ſal armoniac, produced no effect, either as to colour or precipitation.

Mixtures of vinegar and urine, ſyrup of violets, and infuſion of galls, cauſed no other change than what would have taken place in common ſpring-water.

BY EVAPORATION.

FORTY-EIGHT ounces of the water, carefully weighed, gave juſt 9 grains of a ſediment that was very white, and of a ſalt poignant taſte.

BY DISTILLATION.

WE alſo diſtilled 48 ounces of the water. What was firſt drawn off had the ſmell and taſte of veronica, ſomewhat bordering on the ſmell of prunes. What next ran off, was more inodorous and taſteleſs, but had ſome little ſtypticity. Theſe 48 ounces of water yielded, by diſtillation, 12 grains of a very ſalt ſediment.

Experiments made on the Water of the Garden of the Baths.

BY PRECIPITATION.

OIL of tartar per deliquium immediately produced a brown yellow colour in this water, but leſs brown than in the preceding, with a ſlight ſteely taſte; in other reſpects this experiment perfectly correſponded with that made on the water of the ſpring of the bath, which may be referred to.

Spirits of vitriol, of nitre, of ſal armoniac, produced no change.

Mixtures of vinegar and urine, ſyrup of violets, and infuſion of galls, equally effected no change.

BY EVAPORATION.

FORTY-EIGHT ounces of the water gave 8 grains of a greyiſh ſediment, that had an acid ſalt taſte.

Experiments on the Spring called Boſſet.

BY PRECIPITATION.

OIL of tartar per deliquium immediately gave a brown yellow colour, and a ſteely taſte, far beyond what the water of the ſpring and of the garden gave.

Spirits of vitriol, nitre, and ſal armoniac, as well as the vinegar, urine, infuſion of galls, and ſyrup of violets, effected nothing.

BY EVAPORATION.

TWENTY-FOUR ounces of the water gave 4 grains of a greyiſh ſediment, very acid and ſalt. This ſediment, thrown on live coals, yielded a ſmell of vitriolic ſulphur, and the aſhes of this ſediment had a ſalt taſte: it likewiſe melted readily in cold ſpring-water, depoſiting at the bottom of the veſſel what chemiſts call *fæces ſulphuris.*

From all the experiments above made, we infer, that the water of the great ſpring is principally compoſed of a volatile ſulphureous principle, and likewiſe of a volatile principle of the nature of vitriol. It has very few groſs particles, as 6 ounces of the water contain but 1 grain of ſuch particles.

With regard to the water of the bath garden, about two hundred ſteps diſtant from the above-mentioned ſpring, it is evidently of an inferior quality, as the preceding experiments prove.

The ſource of the fountain called Du Boſſet, which is but ſcanty, is certainly colder, and more loaded with vitriolic particles than the others, ſince its heat does not exceed that of ſprings in general; whereas the great ſpring is almoſt lukewarm, and exhales a warm, ſulphureous vapour during winter.

Done at YVERDUN, this 6th July 1729, by

J. FR. DELOPPETS, D. M.
and
H. CONDEY, D. M.

METHOD

Of uſing the YVERDUN WATERS, both as a Bath and Pump;

Founded on extenſive Experience.

THE phyſicians of Yverdun, having remarked that the greateſt number of perſons who come or have been ſent to the baths of this town, have, through ignorance and miſmanagement, acquired complaints, and derived no advantage from the waters; they conſider themſelves as obliged to propoſe to the honoured Lords of the Council, that a paper of inſtructions ſhould be publicly fixed up, for the guidance of all ſuch as wiſh to avail themſelves of the mineral waters in queſtion. And the ſaid phyſicians, being countenanced in their laudable views for the public health and welfare, have carefully drawn up the following paper, which may ſerve as a general guide for the uſe of theſe waters, now in their utmoſt purity.

I. It is invariably adviſed to all perſons reſorting to theſe baths for health, that, having reſted one day after their journey, they ſhould without fail take ſome opening medicine, under the direction of a ſkilful phyſician, or they may truſt to the well known efficacy of a mineral ſalt, extracted from a ſpring in Bohemia, called ſalt of Sedlitz. Half an ounce, or even as far as an ounce of it, according to the conſtitution and age of the patient, may be diſſolved in a quarter of a *pot* * or half a *pot* of water, which ſhould be taken by glaſsfuls, faſting: this ſeldom fails to anſwer for thoſe who either bathe or drink the waters. If the Sal Polychreſk de Seignette ſhould be preferred, it is to be uſed in the ſame manner.

II. Thoſe patients whom the phyſician adviſes only to drink the waters, may begin upon them the day after the purgation, taking at firſt half a pot, and increaſing a full ſized tumbler * every morning, till they have taken as much as their ſtomachs will bear. This quantity ſhould be continued during nine days, it ſhould then be diminiſhed a tumbler full each day; and on the laſt day, when the quantity is reduced but to one tumbler full, the ſame purgative ſalt ſhould be taken as at the beginning.

---

* About 10 ounces. The Lauſanne *pot* is meant. Foreign phyſicians, perhaps with good reaſon, give their purgative ſalts diſſolved in large portions of fluid.

III. Thoſe patients who have occaſion both to drink the waters, and to bathe, ſhould take an aperient as above mentioned, and then the waters during five or ſix days; after which they ſhould begin bathing, when the water they have drank has nearly paſſed off, for an hour or more at a time, the bath being made ſome what above lukewarm †. Coming out of the bath, they ſhould go into a warm bed, where they will reſt, and gently perſpire, for the ſame ſpace

---

* Six or eight ounces.

† About 100 degrees of Fahrenheit's thermometer.

of time they remained in the bath; afterwards they ſhould put on clean linen, and breakfaſt upon a good bouillon, or a little wholeſome wine, and a cruſt of bread; the next day they ſhould ſtay a little longer in the bath, the heat of which may be increaſed as neceſſity requires: and the following days they ſhould, by degrees, prolong their ſtay in the bath as far as two hours; obſerving daily the directions above given.

IV. Thoſe to whom the phyſician recommends the pump, whether to invigorate any weakened or paralytic parts, whether to reſolve any tumours or obſtructions, ſhould have the firſt ſtrokes only lukewarm: the heat of the water ſhould be gradually increaſed with the number of ſtrokes. The pump ſhould be begun the third day from firſt going into the bath, and after having remained in it a quarter of an hour. They ſhould ſtay in the bath one hour, or more, at a time.

V. Thoſe who are adviſed merely the uſe of the baths, would do well, in order to prevent the ill effects of any relics of diſeaſe which the action of heat might ſet in motion, to take an opening medicine before and after the period of bathing, as we have mentioned above. And thoſe who bathe twice a day, ſhould not go into the bath till three hours after they have dined.

VI. Laſtly, all thoſe who uſe theſe waters, but more eſpecially ſuch as bathe, ought not to expoſe themſelves incautiouſly to the open air, particularly the night air; nor ſhould they indulge in exceſſes of any kind whatever, avoiding, according to circumſtances, fruit, all crudities of diet, as ſalad, &c. high-ſeaſoned ragouts, ſpices, ſalted and dried meats, likewiſe paſtry.

FINIS.